

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

COMCAST CABLE COMMUNICATIONS, LLC,

Petitioner,

v.

ENTROPIC COMMUNICATIONS, LLC,

Patent Owner.

CASE: IPR2024-00431

U.S. PATENT NO. 7,295,518

Declaration of Mr. Albert Garrett (Ex. 2001)

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I, Albert Garrett, declare as follows:

1. I am over eighteen years of age, and I am competent to testify regarding the matters set forth in this declaration if called upon to do so.

2. I have been retained in this matter on behalf of the Patent Owner, Entropic Communications, LLC (“Entropic”).

3. I submit this declaration at the request of K&L Gates, counsel for Patent Owner in this proceeding.

4. I have been asked to provide an opinion in response to Comcast Cable Communications, LLC (“Petitioner”) and its expert, Mr. Bertonis, papers in this proceeding regarding whether the Petition and Mr. Bertonis have established whether claims 1–4 of U.S. Patent No. 7,295,518 (“the ’518 patent”) are unpatentable under the United States Patent and Trademark Office’s inter partes review standard of a preponderance of the evidence.

5. In the preparation of this declaration, I have analyzed the ’518 Patent (Ex. 1001), its file history (Ex. 1004), the Declaration of Declaration of James G. Bertonis (Ex. 1002), and three prior art references: Afshary (Ex. 1006), Mirfakhraei (Ex. 1007), and Welles (Ex. 1022). I also have considered the other documents or references cited in this declaration.

6. In forming the opinions expressed below, I have considered the documents listed above, the relevant legal standards as provided to me by counsel, and my own knowledge and experience.

7. I understand Mr. Bertonis has already provided his opinions in Ex. 1002; however, if he is permitted to offer additional opinions, I reserve my right to respond to those should I be asked.

I. Qualifications and Background Information

8. A summary of my experience, qualifications, and current employment are included in my CV, which is attached as Appendix A. The following is a brief summary of my relevant qualifications and professional experience.

9. I received a Bachelor of Science in Electrical Engineering from Auburn University in 1996. Subsequently, I received a Master of Science in Electrical Engineering from Clemson University in 1998, where I studied wireless digital communication. My course work focused on communication systems, mathematics, and probability and information theory. We developed a top-down understanding of systems to have detailed knowledge of performance limits, system parameters, and their implication on underlying statistics and their performances. System limits such as Shannon's Capacity theorem, which states that the maximum rate in bits per second at which information can be reliably relayed on a channel is proportional to the channel bandwidth and the log of the signal-to-noise ratio. The study further

included reviews and discussion of various error correction codes and their decoding methods. Probability studies found their application in understanding characteristics of various channels of communication, such as additive white Gaussian noise (AWGN), multipath models, and noise models. These concepts were often married into systems of spread-spectrum technology as was the typical application at the time for communication that was designed for secrecy and or to address specular multipath environments. As such, we often applied the concepts of code-division multiple-access (“CDMA”) to communication systems. Many of these concepts were integrated into my thesis work, which studied the packet error rate performance of a system where optimum performance is achieved by conjoint optimization of acquisition and payload decoding in a Direct Sequence Spread Spectrum system. My thesis work was titled “Multipath Acquisition for Rake Reception in DS Packet-Radio systems.”

10. After earning my Master of Science, I joined Harris Communications as a staff engineer for the research and development department. Afterwards, I joined Intersil, where I designed and implemented receiver algorithms for 802.11b/g/a/n (also known as Wi-Fi). My work focused on radio impairment compensation algorithms, acquisition algorithms, and tracking algorithms. As a system engineer at Intersil, I was responsible for building system budgets for attenuation, frequency offset and jitter, dynamic range of mixed-signal components.

11. After eight years of working in Wi-Fi and being promoted to Director of Communication Systems, I began to work in the field of in-home networks and MoCA. My experience spans both large corporations and start-ups, including Conexant, Cisco, and ComplexIQ. My responsibilities included system specification and design, algorithm design, bit-true simulation in C/C++, laboratory verification, and interoperability.

12. As a Principal Engineer and Co-Founder of Complex IQ, I advised executive management in corporate strategy, new product research and development, technical marketing, customer interaction, and engineering management. Complex IQ served as a resource to companies, such as Verizon, Comcast, Cox, Intel, and Cisco through contributing to the Board of MoCA, chairing MoCA Certification Working Group, and contributing to MoCA Specification Working Group for 10Gbps standard. In this work, I represented a third semiconductor/algorithm designer in critical conversations to help navigate proposed system solutions for 1gbps, 2.5gbps, 5gbps and 10gbps proposals. These conversations enabled Service Providers to ascertain the reasonableness of various proposals in addition to assessing the service providers wishes and demands for the technologies.

13. I am being compensated for my work associated with this case at an hourly rate plus reimbursement of reasonable expenses. My compensation is not

contingent on my opinions or the outcome of the case, and I have no other interest in this case or the parties thereto.

II. Legal Standards

14. Although I am not a lawyer, I have been advised on the relevant legal principles by Entropic's counsel and have used them as a basis for my opinions.

A. Claims

15. I have also been informed and understand that terms in the patent claims must be read as they would have been understood by a "person of ordinary skill in the art" ("POSITA") at the time of the claimed invention.

16. I understand that a POSITA is a person to which the claimed subject matter pertains with the capability of understanding the scientific and engineering principles applicable to the pertinent art. I understand that the following factors may be considered in determining the level of ordinary skill: the type of problems encountered in the art; prior art solutions to those problems; the speed with which innovations are made; the sophistication of the technology; and the educational level of active workers in the field. I also understand that not every factor may be present and that one or more factors may predominate.

17. I understand that the claims within a patent set forth what the inventors have presented as their inventions. I understand that claims can be independent or

in dependent form, meaning that they depend from the identified independent claims and add requirements to those claims.

B. Specification

18. I understand that there are other parts of a patent, including the abstract, the figures of a patent, the background of the invention, the summary of the invention, and the detailed description of the invention. I understand that these portions often are collectively referred to as the “specification” of a patent. I understand that technically, the claims are part of the specification, but that referring to the “specification” typically means referring to the written description of the inventions rather than the claims. I understand that the specification informs the understanding of the claims by, for example, describing the claimed invention and providing preferred examples of the claimed invention.

19. I have also been informed and understand that terms of a claim should be understood in the context of the claim as a whole. I also understand that the specification of the patent is relevant to the meaning of a claim term. I further understand that the claims must be read in light of the specification.

C. Prosecution History

20. I understand that the correspondence back and forth between the representative of the applicant, and the U.S. Patent and Trademark Office, leading up to the issuance of a patent is called the “file history” or “prosecution history.” It

has been explained to me that, in the process of obtaining a claim of a patent, the inventors and the examiner may make statements explaining their understanding of the scope of their claimed invention. It has also been explained to me that for a statement by the inventors to narrow the scope of a claimed invention, the statement must clearly and unambiguously limit the scope of an invention. I understand this is called “prosecution disclaimer” or “prosecution disavowal.” I understand that the claim language, specification, and file history are referred to as “intrinsic evidence” or “the intrinsic record.”

D. Preponderance of the Evidence

21. I understand that, unlike at the district court, patents subject to inter partes review, such as this proceeding, are not presumed to be valid, such that a lower burden of proof is used to judge the patentability of challenged claims. Unlike the district court’s “clear and convincing” burden, here a “preponderance of the evidence” burden exists.

E. Anticipation

22. I understand that a patent claim is invalid as “anticipated” by a single “prior art” reference if the reference discloses every single element of the claim with sufficient precision and detail to establish that the subject matter of the claim existed in the prior art. In particular, I understand that it is not sufficient to establish that all of the elements are collectively disclosed within the four corners of a particular

document. Instead, the operative question is whether a person of ordinary skill would have understood the elements as being arranged as in the claim itself. I also understand that a prior art reference cannot “anticipate” a patent claim unless that reference enables one of ordinary skill in the art to make and use what is disclosed without undue experimentation. Thus, if the reference does not enable one of ordinary skill to make or use each and every claim limitation, then the claim cannot be “anticipated” by the reference.¹

23. I understand that a prior art reference can disclose a given claim element actually or inherently.

24. In the case of actual disclosure, I understand that a person of ordinary skill would need to have understood that the disclosure corresponds to the claim element in question. I also understand that such disclosure may be implicit rather than explicit. For example, prior art need not use the same words as the claimed invention. However, I understand that ambiguous references do not anticipate.

25. In the case of alleged “inherent” anticipation, I understand that the claim element in question must necessarily be present when practicing the described

¹ I understand that the Petition and Mr. Bertonis are not advancing any anticipation-based theories of unpatentability.

technology even though the prior art reference itself contains no express description of the element in question. In particular, I understand that “possibilities or probabilities” are not sufficient to establish inherency. The mere fact that a certain thing may result from a given set of circumstances is not sufficient. Instead, the essence of inherency is that one of ordinary skill in the art would recognize that a reference unavoidably teaches the property in question.

F. Obviousness

26. I understand that a patent claim may describe an invention that was new (i.e., not anticipated by any prior art reference), but nevertheless be invalid for “obviousness” if the differences between the patented subject matter and the prior art are such that the subject matter as a whole would have been obvious to a person of ordinary skill in the art at the time of the invention was made.²

i. Reasonable Expectation of Success

27. I understand that an invention is not rendered obvious simply on the basis of two or more different disclosures that collectively disclose all of the claimed elements. In other words, an invention is not obvious just because all of the elements that comprise the invention may have been known in the prior art. Instead, a person

² I understand that the Petition and Mr. Bertoni are advancing two “obviousness” theories, one in Ground A and one in Ground B.

of ordinary skill in the art must have had a reasonable expectation of success in pursuing the possibility that turns out to succeed and is claimed. In particular, I understand that knowledge of a goal does not itself render achievement of that goal obvious.

28. I also understand that determining whether or not a claimed invention would have been obvious requires assessing facts related to (1) the scope and content of the prior art, (2) the differences between the prior art and the claimed invention, (3) the level of ordinary skill in the art, and (4) any objective evidence (“secondary considerations”) of non-obviousness. I understand that this is known as consideration of the “Graham Factors.”

ii. Motivation to Combine

29. I further understand that an invention is not obvious just by demonstrating that each of its elements was, independently, known in the prior art. To prove that an invention is obvious, I understand that it can be important to point to a reason or reasons, such as a teaching, suggestion, or motivation, that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed invention does. I understand that this is because inventions in most (if not all) instances rely upon building blocks already known, and claimed discoveries almost of necessity will be combinations of what, in some sense, is already known, therefore it can be important to point to such a reason or reasons. I

understand that in identifying such a reason, the analysis need not require precise teachings in the prior art directed to the specific subject matter of the challenged claim.

30. I understand that it will often be necessary for a court to look to interrelated teachings of multiple patents and the background knowledge possessed by a person having ordinary skill in the art in order to determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue. I understand that any need or problem known in the field of endeavor at the time of invention and addressed by the patent can provide a reason for combining the elements in the manner claimed. I understand that when a work is available in one field of endeavor, design incentives and other market forces can prompt variations of it, either in the same field or a different one. I understand that the combination of familiar elements according to known methods may be obvious when it does no more than yield predictable results.

31. I also understand that a claim is not invalid as obvious if it is more than the predictable use of prior art elements according to their established functions.

32. Further, I understand that while predictability is a touchstone of obviousness, the concept of a “predictable result” under the law refers not only to the expectation that prior art elements are capable of being physically combined, but also that the combination would have worked for its intended purpose.

33. I also understand that if the prior art “teaches away” from combining known elements in the manner claimed by the invention at issue, discovering a successful way to combine them is less likely to be obvious. In particular, I understand that a reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant, or would understand based on the reference that the line of development flowing from the reference’s disclosure is unlikely to be productive of the result sought by the applicant. Likewise, I understand that similar subject matter may not be sufficient motivation for a person of skill in the art to combine references if the references have conflicting elements.

34. Further, I understand that even if a reference does not necessarily “teach away,” the reference’s statements regarding preferences are relevant to a finding regarding whether a person of ordinary skill would have had reason to combine that reference with another reference.

iii. Hindsight

35. I also understand that one must be cautious and resist the temptation to rely on hindsight reasoning when attempting to combine references to suggest that a claim may be obvious. It is important to analyze validity based on the perspective of one of skilled in the art at the time of the invention, which for this case I have

been asked to assume is August 30, 2001, and which I understand is the date Mr. Bertonis and the Petition use as the priority date of the '518 Patent. I understand that objective indicia (or “secondary considerations”) of non-obviousness or obviousness may be particularly probative and helpful in avoiding hindsight. I am not analyzing any secondary considerations as part of this declaration.

iv. Analogous Art

36. I understand that to be eligible as prior art in an obviousness analysis, the reference must be analogous art to the challenged patent. I also understand that it is Petitioner’s burden to prove that their references are analogous art to the challenged patent (i.e., the '518 Patent). I understand that to determine whether a reference is analogous art to the '518 Patent, a two-part test is applied: (1) if the reference is from the same field of endeavor as the challenged patent, the reference is analogous art, and (2) if the reference is reasonably pertinent to the particular problem with which the inventor of the challenged patent is involved, the reference is analogous art. If either of (1) or (2) is satisfied, the reference is considered analogous art. I understand that to determine the field of endeavor, courts have looked to the specifications of the patent and the alleged prior art reference and particularly to the “Background of Invention” and/or “Field of the Invention” sections.

III. Level of Ordinary Skill in the Art

37. In my opinion, a person of ordinary skill in the art (“POSITA”) with respect to the ’518 Patent would have had at least a bachelor’s degree in electrical engineering, computer engineering, or an equivalent field with at least two years of experience with coaxial cables. I based my opinion on the disclosure of the ’518 Patent, including the title, the abstract, and the specification.

38. The ’518 Patent is titled, “Broadband network for coaxial cable using multi-carrier modulation.” Ex. 1001 (’518 Patent), Cover. The Abstract aligns with the title and describes a “broadband local area data network uses coaxial cable wiring for interconnection of terminal devices.” Ex. 1001 (’518 Patent), Abstract. Further, the ’518 Patent defines the technical field as related to coaxial cables: “[t]his invention relates to broadband communication networks and **specifically** to communications using coaxial cable building wiring.” Ex. 1001 (’518 Patent), 1:27-29 (emphasis added). The summary of the invention also specifies coaxial cables because it states that the “present invention uses a form of multi-carrier modulation, orthogonal frequency division multiplex (OFDM), to transmit digital data signals through the coaxial cable wiring installed in homes.” Ex. 1001 (’518 Patent), 4:36-40. Finally, the detailed description and claims also concern coaxial cabling. Ex. 1001 (’518 Patent), 5:14-16 (“FIG. 3 shows a representative frequency allocation between network services and other services on a coaxial wiring system, including

the use by two different networks.”), Fig. 3, claim 1 (reciting “cable wiring comprising a splitter with a common port and a plurality of tap ports, and a plurality of segments of coaxial cable connecting between the splitter tap ports and the network devices”).

39. My analysis and opinions below are given from the perspective of a POSITA in this technological field in the relevant time frame, unless stated otherwise.

40. I satisfied the definition of a POSITA before the filing date of the application leading to the '518 Patent. I now consider myself an expert in the relevant field of technology for the '518 Patent.

41. In forming my opinions for this declaration, I have used the perspective of one of ordinary skill in the art as defined above. My opinions, however, would not be affected if a POSITA is defined as someone who has slightly more or slightly less experience than described above.

42. For example, I understand that Mr. Bertonis opines that a POSITA would be an individual with a degree in electrical engineering, computer engineering, or a related field and experience working in signal processing and/or communication systems/networks. I understand that Mr. Bertonis has further opined that a person with additional education but less professional experience, and vice versa, may qualify as a POSITA. For instance, he believes a POSITA would also

include someone with a bachelor's and three or more years of experience or someone with a master's degree in electrical engineering and 1 year of experience.

43. While I agree that more education experience could be substituted for less professional experience, I disagree that a POSITA would not need at least a year of coaxial-specific experience, experience I obtained through my work with the MoCA standard. MoCA specific experience is not necessary, but it is my opinion that coaxial work-experience is.

IV. Summary of the '518 Patent

44. The '518 Patent provides a broadband local area network using existing coaxial cable wiring for device communication. Ex. 1001 ('518 Patent), Abstract. To optimize communication, the '518 Patent transmits probe messages from one device to another. Ex. 1001 ('518 Patent), Abstract. The probe messages characterize and determine optimum multi-carrier bit loading for each channel of the coaxial local area data network. Ex. 1001 ('518 Patent), Abstract.

45. Figure 1 shows a traditional on-premises coaxial signal distribution plan, which includes signal splitters and network devices. Ex. 1001 ('518 Patent), 5:10-11 ("FIG. 1 is a diagram showing a prior art coaxial signal distribution plan."). The signal splitters distribute downstream signals from the point-of-entry to the network devices. Ex. 1001 ('518 Patent), 1:40-45 ("Signal splitters are used to distribute downstream signals from the point of entry (POE) to the various terminals

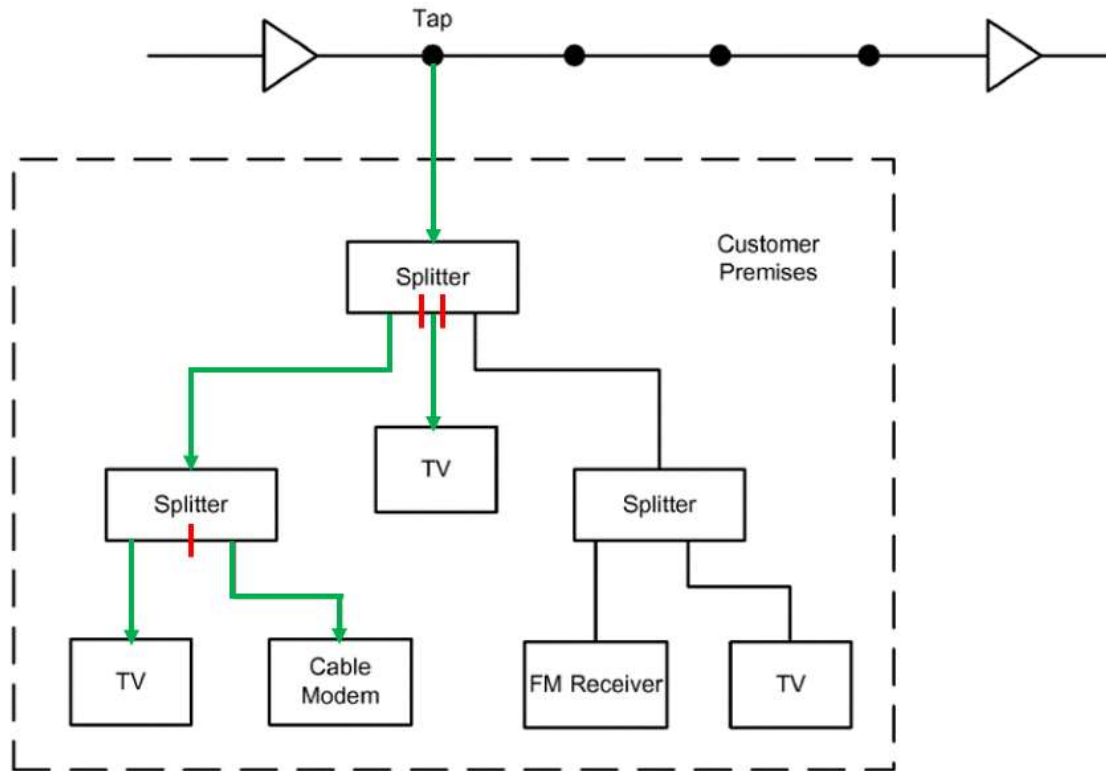
in the home.”), Fig. 1 (annotated below). A signal splitter (“splitter”) receives a signal at the input port and splits the power equally between two output ports. Ex. 1001 (’518 Patent), 1:53-56 (“Signal splitters are commonly used in home and other building type coaxial cable wiring. They have an input port and multiple output ports.”), 61-65 (“A typical two-way splitter splits the power equally between the two output ports if each port is terminated equally.”).

46. Splitters can also include a power-dividing ratio to divide the signal unequally between the two tap ports. Ex. 1001 (’518 Patent), 2:17-27 (“Splitters can be designed with power dividing ratios that are not equal.”). These splitters can balance signal power between terminal devices when the coaxial cable wiring includes multiple levels of splitters. Ex. 1001 (’518 Patent), 2:20-27 (“This type of splitter could be used to balance signal power at all terminal devices when there are multiple levels of signal splitters. A branch that terminates directly to a terminal device would be connected to a higher loss tap port.”). Splitters are typically bi-directional, and thus can also function as signal combiners. Ex. 1001 (’518 Patent), 2:5-10 (“Splitters are generally bi-directional; they can also function as signal combiners, which sum the power from multiple ports into a single output.”). When combining signals, the tap ports become input ports and the common port becomes an output port. Ex. 1001 (’518 Patent), 2:5-10 (“Splitters are generally bi-directional; they can also function as signal combiners, which sum the power from

multiple ports into a single output.”). As a result, the splitter provides a return path for terminal devices to transmit signals back to the cable head end. Ex. 1001 (’518 Patent), 2:11-16 (“The N-way splitter also combines the signals from each room, providing a return path for devices such as cable modems to transmit back to the cable head-end.”). While splitters are required for the network to function, they can also present obstacles for device-to-device communication. Ex. 1001 (’518 Patent), 2:35-38 (“In a conventional cable TV or cable modem use, this isolation is desirable because terminal devices do not communicate with each other, they only communicate through the POE with the cable head-end.”).

47. First, a splitter’s tap ports are isolated from each other, which causes signal attenuation when devices communicate through the tap ports. Ex. 1001 (’518 Patent), 2:27-34 (“Another characteristic of interest in signal splitters is the isolation between output ports.”); Fig. 1 (annotated below). While this inter-port isolation may be desirable in a conventional cable TV configuration where devices did not communicate over the splitters, the ’518 Patent requires devices to communicate with over tap ports. Ex. 1001 (’518 Patent), 2:28-41 (“In a LAN system, terminal devices must communicate directly with each other, therefore attenuation between tap ports in the signal splitters results in an undesirable signal loss.”). Thus, signal loss caused by this isolation is an undesirable byproduct of the existing design. Ex. 1001 (’518 Patent), 2:28-41 (“In a LAN system, terminal devices must communicate

directly with each other, therefore attenuation between tap ports in the signal splitters results in an undesirable signal loss.”).



Ex. 1001, Fig. 1 (annotated) (illustrating a traditional channel path of signal distribution (green) and isolated channel path between devices (red)).

48. Second, on-premises broadband coaxial networks provide different signal paths, leading to variable signal attenuation. Ex. 1001 ('518 Patent), 2:41-48 (“Presenting a further problem to terminal to terminal communications is the variation in attenuation in different branches of the building wiring.”). In other words, the signal path between each terminal device is unique, which results in varying levels of signal loss based on a varied number of splitters/combiners, various connected and nearby devices, and channel length. Ex. 1001 ('518 Patent), 2:41-48.

Signal loss may be overcome by replacing the main splitter at a building point-of-entry with a symmetric splitter/combiner, but a bi-directional power amplifier would have to be installed to boost the signal, and power (which is generally not available at the main splitter) would have to be provided to the amplifier. Ex. 1001 ('518 Patent), 2:54-3:1 ("Another approach to overcoming the splitter inter-port isolation is to replace the main splitter at the building POE with a symmetric power splitter/combiner."); 3:1-4 ("Another disadvantage of this approach is that power must be available for the amplifier, which is not generally present in the area a typical main splitter is located.").

49. Third, imperfect connection points create micro reflections, which may combine with the dominant main signal to produce a multipath signal. Ex. 1001 ('518 Patent), 3:5-10 ("Imperfect terminations at connections create micro reflections within the cable wiring."), 5:26 ("FIG. 8 shows a multipath signal created by a splitter."), Fig. 8. Multipath signals can create inter-symbol interference ("ISI"). Ex. 1001 ('518 Patent), 3:7-10 ("A reflection anywhere in the wiring produces a multipath signal in some or all wiring branches that creates inter-symbol interference (ISI)."). ISI is undesirable because it degrades the bit error rate ("BER") performance of a channel and impairs the ability to achieve high data rates. Ex. 1001 ('518 Patent), 3:15-16 ("ISI will degrade the bit error rate (BER) performance of the

communication channel.”), 4:23-25 (“The multipath environment impairs the ability to achieve high data rates in a communication network.”).

50. The '518 Patent communication network addresses each of these impairments to on-premises broadband networks over coaxial cable. Ex. 1001 ('518 Patent), 4:36-47 (“The present invention uses a form of multi-carrier modulation, orthogonal frequency division multiplex (OFDM), to transmit digital data signals through the coaxial cable wiring installed in homes.”). To address these impairments, the '518 Patent uses variable multi-carrier modulation over its coaxial network, which optimizes the network using probe messages to gather information regarding each signal path. Ex. 1001 ('518 Patent), 4:36-62 (“Based on the estimate of the channel, bit loading is applied to increase the modulation order at carriers with high signal to noise ratio and lower the modulation order at carriers with low signal to noise ratio.”). This information is then used to select the bit loading scheme for multi-carrier modulation. Ex. 1001 ('518 Patent), 4:36-62 (“Based on the estimate of the channel, bit loading is applied to increase the modulation order at carriers with high signal to noise ratio and lower the modulation order at carriers with low signal to noise ratio.”).

51. The channel probe messages, can be formed using a predetermined bit sequence and length, are transmitted between terminal devices to estimate channel characteristics. Ex. 1001 ('518 Patent), 4:48-52 (“Channel probing messages

formed using a predetermined bit sequence and length are transmitted between network devices to estimate the channel characteristics, including the multipath characteristics and a profile of the signal to noise ratio over the frequency band of interest.”). These channel characteristics can include (1) multipath characteristics and (2) the signal-to-noise (“SNR”) profile over the frequency band of interest. Ex. 1001 (’518 Patent), 4:48-52 (“Channel probing messages formed using a predetermined bit sequence and length are transmitted between network devices to estimate the channel characteristics, including the multipath characteristics and a profile of the signal to noise ratio over the frequency band of interest.”). The channel probe message is then analyzed by the receiving device to determine the channel impairment at each carrier frequency. Ex. 1001 (’518 Patent), 4:57-59 (“The receiving device processes the probe messages as received and determines the impairment present at each carrier frequency.”). Based on this channel estimation, the bit loading scheme can be adjusted to increase or decrease the modulation order corresponding to the determined SNR. Ex. 1001 (’518 Patent), 4:59-62 (“Based on the estimate of the channel, bit loading is applied to increase the modulation order at carriers with high signal to noise ratio and lower the modulation order at carriers with low signal to noise ratio.”).

V. Summary of Opinions

52. It is my opinion that Mirfakhraei is not from the same field of endeavor as the '518 Patent. *See* below at ¶¶ 58–72. I disagree with Mr. Bertoni that the '518 Patent's field of endeavor is "network communication[s]." *See* below at ¶¶ 73–79; Ex. 1002 (Bertoni Declaration) ¶ 184 ("Mirfakhraei is in the field of network communication and therefore in my opinion analogous to the '518 patent"). It is my opinion that the '518 Patent's field of endeavor is "wired networking systems using coaxial cables." *See* below at ¶¶ 58–60. Because Mirfakhraei is specific to twisted pair and telephone lines, it does not share the same field of endeavor of the '518 Patent: "wired networking systems using coaxial cables." *See* below at ¶¶ 60–72.

53. It is my opinion that Mirfakhraei is not reasonably pertinent to the particular problem at issue in the '518 patent. *See* below at ¶¶ 73–79. A POSITA would have understood that the '518 Patent solves issues of impairments that restricted high bandwidth communication between devices in a mesh network over existing on-premises coaxial cabling. *See* below at ¶¶ 73–76. Mirfakhraei seeks to address synchronization within a point-to-point twisted pair system, which does not function over on-premises coaxial cabling having splitters. *See* below at ¶¶ 77–79.

54. In my opinion, a POSITA would not have been motivated to combine Afshary and Mirfakhraei. *See* below at ¶¶ 82–117. A POSITA would have understood that Mirfakhraei would contradict Afshary's low-cost and simplistic

goals. *See* below at ¶¶ 82–91. Further, a POSITA would have understood that Mirfakhraei is incompatible with Afshary. *See* below at ¶¶ 92–117.

55. Additionally, the combination of Afshary and Mirfakhraei relies on hindsight bias. *See* below at ¶¶ 118–133. A POSITA would have understood that Afshary already solves the impairments that Mr. Bertonis relies on as support for his motivation to combine. *See* below at ¶¶ 120–124. And even if a POSITA was motivated to improve Afshary, a POSITA would not have look to the fundamentally different system of Mirfakhraei. *See* below at ¶¶ 125–133.

56. Finally, it is my opinion, to the extent that the combination was made, it fails to render obvious claim 3. *See* below at ¶¶ 134–140.

57. I have not been asked to opine on specific constructions or meanings of terms, and have instead been asked to apply the plain and ordinary meaning of the terms of the '518 Patent. While Mr. Bertonis did provide specific constructions for certain terms of claims 2 and 4, I do not take a position on whether those constructions are accurate or not, and I have not been asked to do so.

VI. Opinions

A. Mirfakhraei is not from the same field of endeavor as the '518 Patent

58. I disagree with Mr. Bertonis that the '518 Patent's field of endeavor is “network communication.” Ex. 1002 (Bertonis Declaration), ¶ 88 (“Mirfakhraei is in the field of network communication and therefore in my opinion analogous to the

'518 patent.”). It is my opinion that the '518 Patent's field of endeavor is “wired networking systems using coaxial cables.” *See* ¶¶ 59–61. I understand the “field of endeavor” to be relevant to whether a reference can be used in an obviousness combination. I further understand that the “field of endeavor” is the field to which the reference (prior art or patent) is directed to. This field of endeavor is supported by the background of invention, the field of the invention, and the claims and title of the '518 Patent, which I understand are appropriate places to look to ascertain the field of endeavor of a reference or patent. *See*, ¶ 36.

59. First, the '518 Patent is titled, “Broadband network for coaxial cable using multi-carrier modulation.” Ex. 1001 ('518 Patent), Cover. Second, the abstract describes a wired networking system over coaxial cabling. Ex. 1001 ('518 Patent), Abstract. (“A broadband local area data network uses coaxial cable wiring for interconnection of terminal devices.”). Third, the “technical field” of the '518 Patent states that this “invention relates to broadband communication networks and specifically to communications using coaxial cable building wiring.” Ex. 1001 ('518 Patent), 1:27-29 (“This invention relates to broadband communication networks and specifically to communications using coaxial cable building wiring.”). Fourth, the background focuses on coaxial networks and the issues present in such networks. *See* Ex. 1001 ('518 Patent), 1:33-4:33. The '518 Patent's background also distinguishes between on-premises networks with out-of-home systems. *See* Ex.

1001 ('518 Patent), 1:33-4:33. Fifth, the claims require a data network implemented over coaxial cables. *See* Ex. 1001 ('518 Patent), claim 1.

60. In addition to this evidence, a POSITA would have recognized the '518 Patent's field of endeavor as "wired networking systems using coaxial cables" based on the references to coaxial cabling. Ex. 1001 ('518 Patent), 4:37-40 ("The present invention uses a form of multi-carrier modulation, orthogonal frequency division multiplex (OFDM), to transmit digital data signals **through the coaxial cable wiring** installed in homes."), 6:29-32 ("**In a coaxial cable environment** signal-to-noise ratio (SNR) is generally high. To be useful, the SNR is preferably in the range of 8 to greater than 30 dB."), 5:14-16 ("FIG. 3 shows a representative frequency allocation between network services and other services **on a coaxial wiring system**, including the use by two different networks."), Claim 3 ("A network device for communicating data to other network devices over **a coaxial wiring system ...**").

61. It is my opinion that Mirfakhraei's field of endeavor is not "wired networking systems using coaxial cables." Mirfakhraei does not mention "coaxial" at all and instead is limited to twisted pair communication. Ex. 1007 (Mirfakhraei), [0003] (noting that DMT protocols were originally developed for use over conventional telephone lines), [0015] (disclosing the use of ADSL transceivers to transmit and receive data), [0017] (disclosing that communications occur over

telephone wires). Unlike the field of endeavor of the '518 Patent, Mirfakhraei's field of endeavor is multi-carrier signaling over twisted pair telephone lines.

62. Mirfakhraei provides a system for “determining a bit loading for a discrete multi-tone (DMT) communication signal” on a two-node, point-to-point, full-duplex, twisted pair network. Ex. 1007 (Mirfakhraei), [0005]. Mirfakhraei asserts that its system is specific to twisted pair with reiterations of using “modems,” “transceivers,” “xDSL,” and “telephone wires.” Ex. 1007 (Mirfakhraei), [0014] (“[A] modem or transceiver that implements a DMT protocol (herein after an xDSL transceiver) employs a ‘bit-loading’ process that characterizes the capabilities of sub-channels and determines the number of bits-per-symbol transmitted over the channel.”), [0015] (“Fig. 1 is the general block diagram of a client side (atu-r) ADSL transceiver 100 including a transmitter 110 and a receiver 190, that connect to a conventional telephone line via a hybrid circuit 150.”), [0019] (“Hybrid circuit 150 transmits the analog signal from DAC 140 to telephone lines 152 coupled to hybrid circuit 150.”), [0021] (“Hybrid circuit 150 directs a received analog communication signal from telephone lines 152 to receiver 190.”).

63. Mr. Bertonis includes a single sentence related to Mirfakhraei's field of endeavor but fails to appreciate the difference between the shared medium of coaxial cable and the point-to-point twisted pair system. Ex. 1002 (Bertonis Declaration), ¶ 88 (“Mirfakhraei is in the field of network communication and therefore in my

opinion analogous to the '518 patent.”). A POSITA would have understood that coaxial cabling and twisted pair mediums are fundamentally different mediums.

64. A POSITA would have understood that coaxial cabling and twisted pair have a different physical structure, resulting in different properties. Namely, coaxial cable is shielded with precisely controlled geometries at manufacturing. *See* Ex. 2003 (Signal-Integrity), 82 (“The term ‘coaxial’ refers to the fact that it has a small center conductor surrounded by a cylinder of insulating material, which is in turn surrounded by a cylindrically shaped conductor. The two conductors are coaxial (get it?) and so they make a capacitor.”). Because of this shielding, coaxial cables can support large bandwidths and high-frequency signals (e.g., 900 MHz to 6 GHz). Ex. 2004 (Coaxial-Products) (coaxial cable “is designed to carry high-frequency signals, 900 MHz to 6GHz, and to protect those signals against electromagnetic interference (EMI) from external sources.”).

65. Unlike coaxial cable, twisted pair is unshielded to save manufacturing costs. *See* Ex. 2003 (Signal-Integrity), 121 (“This is what Ethernet uses – unshielded twisted pair (UTP). This is important because, as one might guess, the unshielded cable is cheaper than shielded.”). As a result of the lack of shielding, twisted pair suffers from a loss of signal energy over distance and also lossy signal propagation. Ex. 2003 (Signal-Integrity), 107, 112-115. Twisted pair, therefore, behaves as a low-pass filter by causing higher frequency signals to be filtered out while successfully

transmitting low frequency signals. As an example, CAT5 cable has a specified passband of 100MHz over a 100m cable.

66. These constraints are shown in Mirfakhraei. Namely, Mirfakhraei explains that bandwidth constraints in twisted pair led to the development of various transmission schemes, including ADSL and VDSL. Ex. 1007 (Mirfakhraei), [0002] (“Discrete Multi-Tone (DMT) protocols have been developed to increase the data transmission rate over conventional telephone lines. Examples of DMT protocols include the Asymmetric Subscriber Loop (ADSL or G.992.1), the High bit rate Digital Subscriber Loop (HDSL), the Very fast asymmetric Digital Subscriber Loop (VDSL), and light rate ADSL (G.992.2), which have been proposed by or are standards of groups including the ITU, ANSI, and ETSI. A DMT protocol simultaneously uses multiple carrier frequencies where each carrier frequency corresponds to a subchannel. Each signal for a sub-channel has relatively narrow bandwidths (e.g., 4 kHz) to reduce distortion within the sub-channel signal.”).

67. Despite these efficiency improvements, bandwidth of twisted pair is still much smaller than coaxial cable. For example, each sub-channel in Mirfakhraei has a narrow bandwidth of 4 kHz. Ex. 1007 (Mirfakhraei), [0001] (“[C]onventional phone lines have frequency dependent attenuation, which distorts communication signals having large bandwidths. Accordingly, the maximum data rate of a conventional modem architecture is limited.”), [0002] (describing the use of sub-

channels to break the narrow bandwidths into smaller signal sub channels “[e]ach signal for a sub-channel has relatively narrow bandwidths (e.g., 4 kHz) to reduce distortion within the sub-channel signal.”). In further examples, vDSL2 is limited to bandwidths of 36MHz using 8192 such subcarriers and G.Hn is limited to bandwidths of 200MHz. Thus, technologies on twisted pair are bandwidth limited.

68. In contrast, coaxial cabling has no similar limit and can utilize frequencies as high as 900MHz-6GHz. Ex. 2004 (Coaxial-Products), (coaxial cable “is designed to carry high-frequency signals, 900 MHz to 6GHz, and to protect those signals against electromagnetic interference (EMI) from external sources.”). Because of these bandwidth and signal integrity differences, different solutions are common on each medium. For example, systems common on coaxial cabling leverage its excess bandwidths in a shared medium to reduce the cabling required, i.e. cable TV with multiple 6MHz channels. Systems are commonly branched (sharing cables) and differentiate services by means of frequency division across many channels and end-points. Alternatively, systems operating on twisted pair medium tend to be point-to-point systems, including DSL, using dedicated wires between end-points and sharing the wire via frequency-division for upstream and downstream signaling, as the provided passband is not adequate for sharing more than two links when high bandwidth is required.

69. In addition to bandwidth differences, coaxial cable and twisted pair have dramatically different frequencies and therefore wavelengths. Ex. 2003 (Signal-Integrity), 82 (“The term ‘coaxial’ refers to the fact that it has a small center conductor surrounded by a cylinder of insulating material, which is in turn surrounded by a cylindrically shaped conductor. The two conductors are coaxial (get it?) and so they make a capacitor.”). For example, a 1 MHz signal has a wavelength of roughly 300m. Lower frequencies on twisted pair have even longer wavelengths. A higher frequency cable signal (e.g., at 900 MHz), has a much smaller wavelength of 0.33m.

70. The difference in wavelength is physically significant as transmission-line effects, such as reflections, cause the frequency response of coaxial cable to be much more chaotic than telephone lines. Ex. 2003 (Signal-Integrity) 94-96, 99-101. Signals transmitted at high frequencies over twisted pair results in higher losses and drops in signal strength while signals transmitted over coaxial cables at high frequencies are known to be chaotic, with sharp increases in attenuation at very specific frequencies. Furthermore, these transmission-line effects appear over much shorter cable lengths, such as those found inside homes, than telephone lines. Inside a home, it is clear that propagation over telephone lines is lumped, not distributed, and transmission-line effects such as reflections disappear. Based on these

differences, a POSITA would have understood that twisted pair is fundamentally different from coaxial cable.

71. Besides the physical medium itself, the network topology of the '518 Patent is also fundamentally different than Mirfakhraei's point-to-point network. For example, the '518 Patent's network is a branched topology that includes splitters that route signals from one input to multiple destinations. *See* Ex. 1001 ('518 Patent), 1:40-45 ("Signal splitters are used to distribute downstream signals from the point of entry (POE) to the various terminals in the home."), 1:53-56 ("Signal splitters are commonly used in home and other building type coaxial cable wiring. They have an input port and multiple output ports."). The '518 Patent communicates across splitter tap ports, which causes signal attenuation based on inter-tap isolation. Ex. 1001 ('518 Patent), 2:27-34 ("Another characteristic of interest in signal splitters is the isolation between output ports. The isolation is typically between 10 dB and 40 dB. This isolation attenuates signals communicating between tap ports.").

72. Mirfakhraei's system is a point-to-point network. Ex. 1007 (Mirfakhraei), [0006] ("As part of the DMT initialization, a local modem or transceiver communicates to a remote modem or transceiver bit loadings determined using processes in accordance the invention."). Mirfakhraei does not communicate across splitter tap ports and does not include the branch topology like that of the '518 Patent. *See generally* Ex. 1007 (Mirfakhraei). In view of these fundamental

differences, a POSITA would have understood that Mirfakhraei does not share the same field of endeavor as the '518 Patent.

B. Mirfakhraei is not reasonably pertinent to the problems that the '518 patent addresses

73. Mr. Bertonis did not analyze or opine on whether Mirfakhraei is reasonably pertinent to the problems that the '518 patent addresses. Regardless, it is my opinion that Mirfakhraei is not reasonably pertinent to the problems that the '518 patent addresses. The '518 Patent solves impairments specific to on-premises communications between network devices over existing coaxial cable wiring. Ex. 1001 ('518 Patent), 4:36-47. *See* ¶¶ 74–76. Mirfakhraei addresses synchronization within a point-to-point, twisted pair system. *See* ¶¶ 77–79.

74. Starting with the '518 Patent, its background lays out a specific problem and solution. The '518 Patent addresses impairments that previously restricted high bandwidth communication between devices over on-premises coaxial cabling (rather than impairments, generally). Ex. 1001 ('518 Patent), Abstract, 4:19-33 (“The prior art references address communicating between a cable head end and in-home units but do not address the impairments present in the home wiring that restricts high bandwidth communication between devices within the home.”).

75. These impairments that restrict high bandwidth communication include (1) inter-port isolation from communicating across splitters, (2) variable signal attenuation caused by different channel paths, and (3) imperfect connection points

at splitters, which cause micro reflections. Ex. 1001 ('518 Patent), 2:27-34 (“Another characteristic of interest in signal splitters is the isolation between output ports. The isolation is typically between 10 dB and 40 dB. This isolation attenuates signals communicating between tap ports.”), 2:41-48 (“Presenting a further problem to terminal to terminal communications is the variation in attenuation in different branches of the building wiring.”), 3:5-16 (“Imperfect terminations at connections create micro reflections within the cable wiring.”), 4:23-25 (“The multipath environment impairs the ability to achieve high data rates in a communication network.”). Each of these impairments are caused by using the preexisting in-home coaxial network as the '518 Patent does.

76. For example, coaxial networks include splitters that distribute signals downstream while twisted pair networks do not use splitters in this fashion. Ex. 1001 ('518 Patent), 1:40-42 (“Signal splitters are used to distribute downstream signals from the point of entry (POE) to the various terminals in the home.”). However, splitter ports are isolated and include imperfect connections, causing inter-port isolation and reflections. Ex. 1001 ('518 Patent), 2:27-34 (“Another characteristic of interest in signal splitters is the isolation between output ports. The isolation is typically between 10 dB and 40 dB. This isolation attenuates signals communicating between tap ports.”). As the splitter causes these issues, these types of issues (e.g., inter-port isolation) are not present in a network that does not use

splitters. Further, signal paths vary between the devices in a coaxial network due to the branch topology, causing variable signal attenuation. Ex. 1001 ('518 Patent), 2:41-48 ("Presenting a further problem to terminal to terminal communications is the variation in attenuation in different branches of the building wiring."). These issues are specific to coaxial cable installations. The '518 Patent overcomes these issues that previously restricted network devices from communicating with each other.

77. Mirfakhraei explains that bit-loading techniques can affect the total bandwidth and rate for the connection of the system by estimating the signal attenuation for each sub-channel. Ex. 1007 (Mirfakhraei), [0006]. The signal attenuation in Mirfakhraei is a frequency dependent issue that "distort[s] communication signals having large bandwidths." Ex. 1007 (Mirfakhraei), [0002] ("Similarly, conventional phone lines have frequency dependent attenuation, which distorts communication signals having large bandwidths.").

78. DMT protocols can address these distortions by allowing each signal to be transmitted over narrow bandwidths. Ex. 1007 (Mirfakhraei), [0003] ("Each signal for a sub-channel has relatively narrow bandwidths (e.g., 4 kHz) to reduce distortion within the sub-channel signal."). And DMT protocols also allow "the local modem [to] estimate the capacity or the target loading of each sub-channel." Ex. 1007 (Mirfakhraei), [0006]. Mirfakhraei provides "a process for determining a

bit loading for a discrete multi-tone (DMT) communication signal.” Ex. 1007 (Mirfakhraei), [0005] (“In accordance with the invention, a process for determining a bit loading for a discrete multi-tone (DMT) communication signal may include any combination of the steps . . .”).

79. Mirfakhraei’s system “for determining a bit loading for a discrete multi-tone (DMT) communication signal” is not reasonably pertinent to the problems addressed by the ’518 Patent. Mirfakhraei communicates over a single point-to-point communication system and does not use splitters or address signals that traverse splitters. Accordingly, Mirfakhraei does not suffer from inter-port isolation or imperfect connections at splitters, which are the specific problems that the ’518 Patent is reasonably pertinent to. Also, Mirfakhraei does not use the same communication system with the branched topology as the ’518 Patent and thus does not suffer from the same variable attenuation as addressed by the ’518 Patent. Finally, regarding general “impairments,” a POSITA would recognize that the signal impairments of Mirfakhraei (which are tied to attenuation characteristics of cables telephone cables with increased length) are fundamentally different from impairments of the ’518 Patent (which are specific to in-home coaxial networks). For these reasons, Mirfakhraei is not reasonably pertinent to the problems that the ’518 patent addresses.

VII. GROUND A

80. Mr. Bertonis contends that a POSITA would have been motivated to combine Afshary and Mirfakhraei. *See, e.g.*, Ex. 1002 (Bertonis Declaration), ¶ 139 (“It is my opinion that a POSITA would have been motivated to modify Afshary’s cable LAN adapter to implement the DMT bit-loading protocol of Mirfakhraei because doing so would increase the data transmission rate of Afshary’s coaxial cable network, as taught by Mirfakhraei.”). I disagree with Mr. Bertonis that a POSITA would have been motivated to combine Afshary and Mirfakhraei.

81. A POSITA would not have been motivated to combine Afshary and Mirfakhraei. *See* ¶¶ 82–117. Rather, a POSITA would have understood that Mirfakhraei would contradict Afshary’s goals. *See* ¶¶ 82–91. Further, a POSITA would have understood that Mirfakhraei is incompatible with Afshary. *See* ¶¶ 92–117. Additionally, the combination of Afshary and Mirfakhraei relies on hindsight bias. *See* ¶¶ 118–133. A POSITA would have understood that Afshary already solves the impairments that Mr. Bertonis relies on as support for his motivation to combine. *See* ¶¶ 120–124. And even if a POSITA was motivated to improve Afshary (which I disagree with), a POSITA would not have looked to the fundamentally different system of Mirfakhraei. *See* ¶¶ 125–133.

A. There is a lack of motivation to combine Afshary and Mirfakhraei

**i. Mirfakhraei's complex multi-carrier modulation
contradicts Afshary's goals**

82. Mr. Bertonis opines that a POSITA would have been “motivated to modify Afshary’s cable LAN adapter to implement the DMT bit-loading protocol of Mirfakhraei.” Ex. 1004 (Bertonis Declaration), ¶¶ 139, 141 (“It is my opinion that a POSITA would have understood that modifying Afshary’s cable LAN adapter 32 to implement the DMT bit-loading protocol of Mirfakhraei would entail incorporating the functionality of the above-identified components of Mirfakhraei’s transmitter 110 and receiver 190.”). I disagree with Mr. Bertonis.

83. First, a POSITA would have identified Afshary’s goal as providing a simple, low-cost home network. *See* ¶¶ 84–87. Second, a POSITA would have understood that replacing Afshary’s single-carrier modulation with Mirfakhraei’s multi-carrier modulation would require adding the functionality of “Mirfakhraei’s transmitter 110 and receiver 190” to Afshary’s adapters. Ex. 1004 (Bertonis Declaration), ¶ 141; *see* ¶¶ 88–91. These requirements would add unwanted complexity and costs to Afshary’s network. Accordingly, a POSITA would not have been motivated to implement Mirfakhraei’s multi-carrier modulation on Afshary’s cable LAN adapters because Mirfakhraei’s multi-carrier modulation would frustrate Afshary’s goal of providing a simple, low-cost home network.

A. Afshary's goal is to provide a simple, low-cost networking solution

84. A POSITA would have understood Afshary's goal was to provide a simple, low-cost home network based on its disclosure. For example, in the "Background Information," Afshary explains that other non-coaxial, mediums for in-home networking "suffer from being expensive." Ex. 1006 (Afshary), [0005] ("Solutions that require new wires suffer from being expensive as well as technology that has not been proven over time as compared to coaxial cables."). Additionally, Afshary highlights the cost considerations in its table of alternative mediums, listing the costs of installation and maintenance as limitations. Ex. 1006 (Afshary), Table 1 (reproduced below).

TABLE 1

<u>Alternative Mediums</u>	
MEDIUM	LIMITATIONS
AC power-lines	Unregulated Low bit-rate (Harsh environment) Data security issues Perceived usage hazards
Telephone lines	RF interference RF emissions regulations
Wireless	Limited bandwidth Expensive Data security issues Transmission disruption due to movement
New wires	Installation costs Maintenance costs

Ex. 1006 (Afshary), Table 1 (annotated). Further, Afshary expressly states that it's purpose is "to transmit data around the home and elsewhere in **cost-effective**, quick, and secure fashion." Ex. 1006 (Afshary), [0006] ("Thus, there is a need to transmit data around the home and elsewhere in cost-effective, quick, and secure fashion."), [0012] ("The benefits of the cable LAN is the ability transmit data in cost-effective, secure fashion, without interfering with cable service company operations.") (emphasis added).

85. In view of these considerations, a POSITA's understanding would be that Afshary's goal is to provide a simple, cost-effect home network. Ex. 1006 (Afshary), [0024], [0036], [0037].

86. Specifically, Afshary's goal of providing a simple, low-cost system is reflected in its design of the cable LAN adapter: "It is important for cable LAN adapter 32 to be screened from noise and hardy enough to work in any environment **while remaining inexpensive.**" Ex. 1006 (Afshary), [0037]. And "to keep costs low and the system robust, the architecture design of adapter 32 uses a digital modulation scheme such as Frequency Shift Keying (FSK) modulation or Binary Phase Shift Keying (BPSK) modulation." Ex. 1006 (Afshary), [0037], [0024] (explaining that "costs to changing the infrastructure of the data suppliers became the prohibiting factor" when considering the operating frequency). Each of

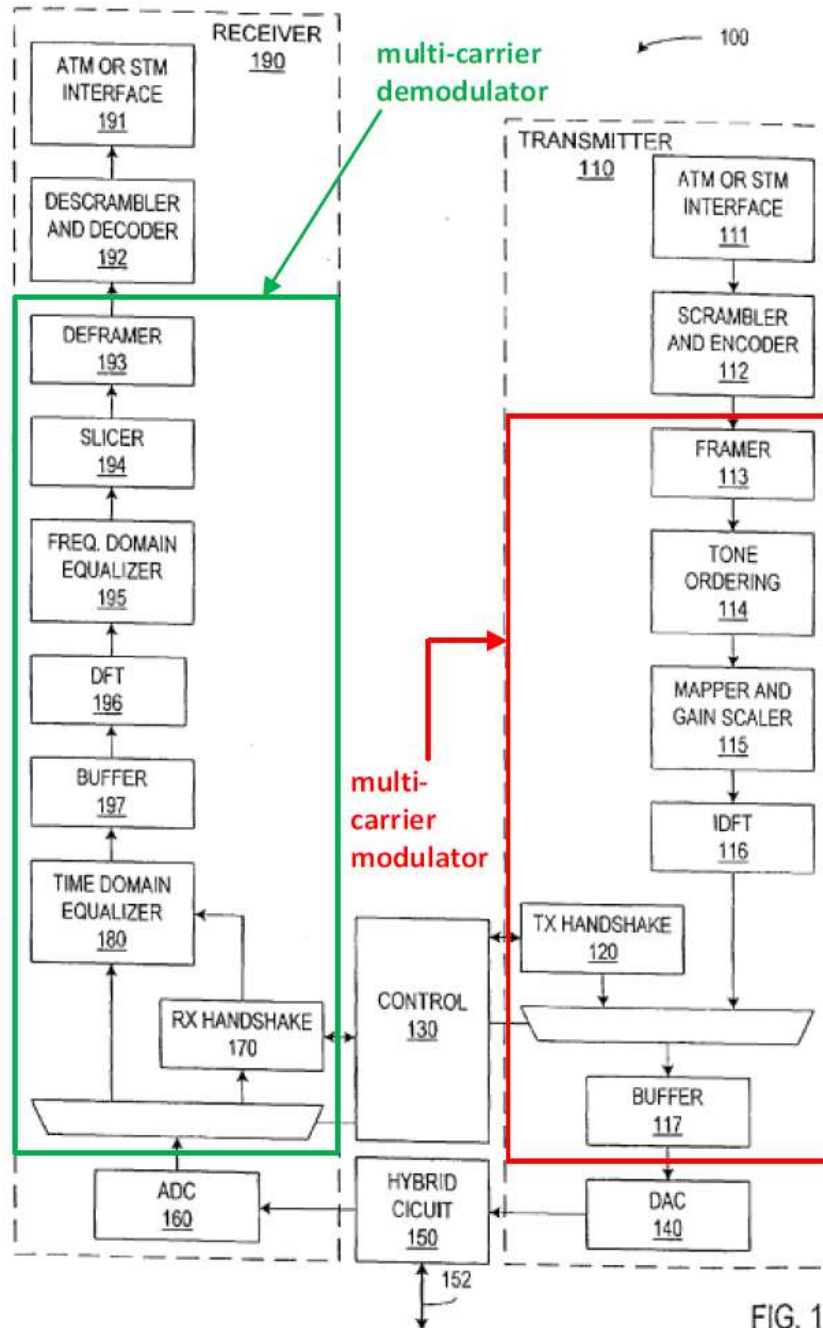
Afshary's digital modulation schemes are single-carrier schemes, which Afshary chooses to "keep costs low and the system robust." Ex. 1006 (Afshary), [0037].

87. Afshary's goal of providing a simple, low-cost system is also reflected in its selection of its encoders. Namely, Afshary preferably uses a "Reed-Solomon Error Correction Code (R-S ECC) encoder." Ex. 1006 (Afshary), [0036]. Afshary explains that the "advantage of using a RS ECC encoder is that the RS ECC encoder may be reused in the FEC decoder 94, thereby dramatically **reducing the complexity** of syndrome calculation and thus **reducing processing speed burden** on the syndrome block." Ex. 1006 (Afshary), [0036] (emphasis added).

B. Mirfakhraei's multi-carrier modulation

would add costs and complexity to Afshary's system

88. Mirfakhraei's multi-carrier modulation contradicts Afshary's goals by adding additional costs and complexity. First, Mr. Bertonis highlights the added complexity of Mirfakhraei's multi-carrier modulation through the annotations of Mirfakhraei's system. These annotations attempt to designate Mirfakhraei's multi-carrier modulator and demodulator. Ex. 1002 (Bertonis Declaration), ¶ 130; Ex. 1007 (Mirfakhraei), Figure 1 (annotations added by Mr. Bertonis) (reproduced below).



Ex. 1002 (Bertonis Declaration), ¶ 129 (annotated by Mr. Bertonis).

89. As shown in the Mr. Bertonis' annotated Figure 1, Mirfakhraei provides an ADSL transceiver including a transmitter 110 (right side of Figure 1) and a receiver 190 (left side of Figure 1), which are connected to a conventional telephone

line. Ex. 1007 (Mirfakhraei), [0014] (“In accordance with an aspect of the invention, a modem or transceiver that implements a DMT protocol.”), [0015] (“Fig. 1 is the general block diagram of a client side (atu-r) ADSL transceiver 100 including a transmitter 110 and a receiver 190, that connect to a conventional telephone line via a hybrid circuit 150.”). Mirfakhraei also includes a scrambler 112, which encodes data that is broken into a data stream by the framer 113. Ex. 1007 (Mirfakhraei), [0017] (“A scrambler and encoder 112 performs initial encoding of the data.”), [0017] (“A framer 113 breaks the encoded data stream from encoder 112.”).

90. Additionally, Mirfakhraei states that the “tone ordering block 114 orders the bit sets by sub-channel for a constellation mapper 115” and the “constellation mapper 115 determines a QAM symbol associated with the bit set for the quadrature amplitude modulation (QAM) of the assigned sub-channel.” Ex. 1007 (Mirfakhraei), [0017]–[0018]. Then, the “IDFT block 116 receives the scaled QAM symbols that constitute a DMT symbol and performs inverse Fourier transforms on DMT symbols.” Ex. 1007 (Mirfakhraei), [0019]. The receiver 190 performs a process equally as complicated. Ex. 1007 (Mirfakhraei), [0020]–[0024]. With this functionality of the transmitter 110 and the receiver 190, Mirfakhraei builds a complex parallel-processing system that requires precise gain, frequency, and phase control to allow detection of high-order QAM. Conversely, Afshary

constrains the problem to sequential processing of QPSK symbols, which significantly mitigates the burden of gain and frequency tracking algorithms.

91. Mr. Bertonis' proposed combination requires "incorporating the functionality of the above-identified components of Mirfakhraei's transmitter 110 and receiver 190." Ex. 1004 (Bertonis Declaration), ¶¶ 139, 141 ("It is my opinion that a POSITA would have understood that modifying Afshary's cable LAN adapter 32 to implement the DMT bit-loading protocol of Mirfakhraei would entail incorporating the functionality of the above-identified components of Mirfakhraei's transmitter 110 and receiver 190.'). But this would require the complex functionality recited in paragraphs 89 and 90. Thus, assuming that a POSITA would be able make Mr. Bertonis' combination (which they would not), a POSITA would not be motivated to make such combination because the combination would frustrate Afshary's goal of providing a simple, low-cost home network.

ii. Mirfakhraei's system is incompatible with Afshary's network

A. Mirfakhraei's multi-carrier modulator and demodulator would not work in Afshary's system

92. Mr. Bertonis opines that a POSITA would have incorporated Mirfakhraei's multi-carrier modulator and multicarrier demodulator into the ASIC

of Afshary's cable LAN adapter. Ex. 1004 (Bertonis Declaration), ¶ 141 ("It is my opinion that a POSITA would have understood that modifying Afshary's cable LAN adapter 32 to implement the DMT bit-loading protocol of Mirfakhraei would, for example, entail incorporating the functionality of Mirfakhraei's multi-carrier modulator and multicarrier demodulator into an ASIC (e.g., ASIC 78)."). I disagree with Mr. Bertonis. A POSITA would have understood that Mirfakhraei's "multi-carrier modulator and multi-carrier demodulator" would fundamentally change the architecture of the ASIC in Afshary. Ex. 1004 (Bertonis Declaration), ¶ 141. Based on this fundamental change, a POSITA would not have been motivated to incorporate Mirfakhraei's multi-carrier modulator and multicarrier demodulator into the ASIC of Afshary's cable LAN adapter as Mr. Bertonis opines.

93. Initially, Mr. Bertonis agrees that Afshary uses a "single-carrier system" in a coaxial environment. Ex. 1004 (Bertonis Declaration), ¶ 146 (Afshary's "ASIC 78 provid[es] baseband single-carrier modulation and demodulation."). But unlike Afshary, Mirfakhraei includes a multi-carrier modulator and demodulator, which transmit in an "always on" fashion. Ex. 1007 (Mirfakhraei), [0019] ("IDFT block 116 repeats the inverse Fourier transforms at a rate equal to the symbol rate to maintain a constant stream of time domain samples."). Mr. Bertonis does not consider several issues with integrating

Mirfakhraei's multi-carrier modulator and demodulator and into Afshary's "single-carrier system." Ex. 1004 (Bertonis Declaration), ¶ 146.

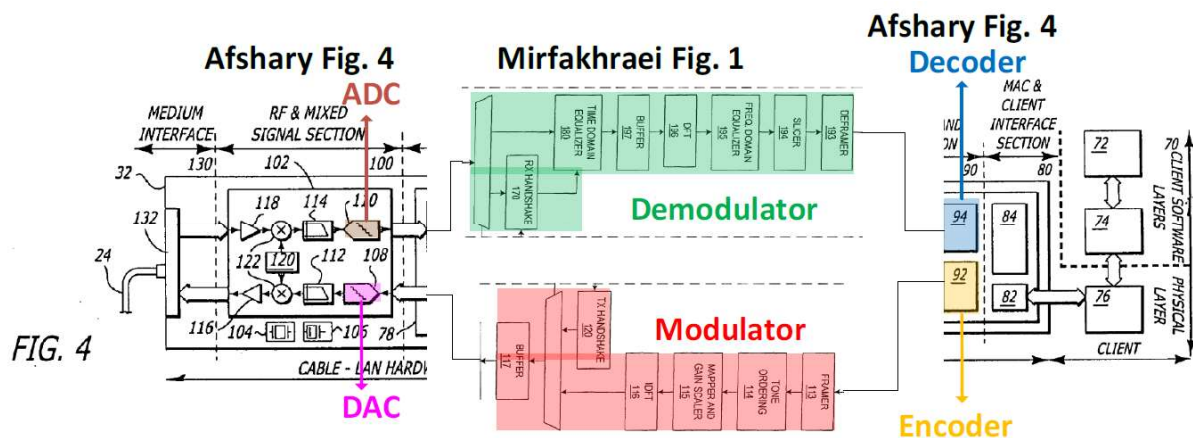
94. Mr. Bertonis' declaration is silent about the substitution of the DAC 108 of Afshary with the DAC 140 of Mirfakhraei's. Ex. 1002 (Bertonis Declaration), ¶¶ 143 ("Afshary's modulated symbols from modulator 96 are then provided to the DAC 108 (pink) for conversion to analog signals."), 143 ("Mirfakhraei's modulated symbols are then provided to the DAC 140 (also pink) for conversion to an analog signal.") (original emphasis). Further, the baseband transmissions from Mirfakhraei are different from those of Afshary. To the extent that a POSITA would have been motivated to make Mr. Bertonis' combination (which I do not agree with), Afshary would require additional improvements in the baseband layer. Examples of these improvements includes packetizing Mirfakhraei's transmissions into units with a preamble and payload, defining a preamble with an acceptable time duration and performance in terms of gain, frequency, and phase accuracy for use with multi-carrier modulation, and defining Mirfakhraei's handshake signal in a compact, functional way as opposed to the unbounded fashion of the DSL proposal. A POSITA would have understood that Mirfakhraei's modulator and demodulator could not be added Afshary without these required improvements.

95. Mirfakhraei uses a handshake process to determine bit-loading. Ex. 1007 (Mirfakhraei), [0020]–[0023] (“Transmitter 110 also includes a TX handshake block 120 which generates time domain samples for a handshake signal sent to a remote transceiver when establishing a connection or during retaining.”). The handshake process originates at the TX Handshake 120, which transmits a known pseudo-random signal to the receiver. Ex. 1007 (Mirfakhraei), [0020]–[0022] (“The estimated signal to noise ratios $SNR(i)$ can be determined, for example, by directing the remote transceiver to transmit a known pseudo-random signal and then comparing the received signal to the known signal.”).

96. This signal is received by the receiver, routed to the RX Handshake block 170 and used to calculate the SNR for each sub-channel. Ex. 1007 (Mirfakhraei), [0022]–[0023] (“Based on the estimated ratios $SNR(i)$, Rx handshake block 170 determines a bit loading $b(i)$ and a scaling $g(i)$ for each sub-channel i , and control 130 directs transmitter 110 to inform the remote transceiver of the determined loadings $b(i)$ and scaling $g(i)$.”). Then, the controller 130 directs the transmitter 110 “to inform the remote transceiver of the determined loadings $b(i)$ and scaling $g(i)$.” Ex. 1007 (Mirfakhraei), [0022]–[0023].

97. A POSITA would have understood that the controller 130 is a required component and, without controller 130, the RX Handshake block would not be transmitted to the transmission side of the modem and proper SNR allocation to the

subchannels could not be achieved. *See* Ex. 1007 (Mirfakhraei), Figure 1. However, the controller 130 is absent from Mr. Bertonis' combination. Ex. 1002 (Bertonis Declaration), ¶¶ 142–144. Mr. Bertonis only implements Mirfakhraei's modulator, demodulator, and the relevant coders to be into Afshary's system. Ex. 1002 (Bertonis Declaration), ¶¶ 142–144. This is also reflected in Mr. Bertonis' figure that purports to implement components of Mirfakhraei into Afshary. Ex. 1002 (Bertonis Declaration), ¶ 144 (annotated figure reproduced below).



Ex. 1002 (Bertonis Declaration), ¶ 144.

98. Afshary's system does not provide for an alternative synchronization mechanism that would function in Mr. Bertonis' combination, which does not include required components of Mirfakhraei (i.e., the controller 103). Rather, Afshary uses a client interface to keep track of the time for the communications for use its Time Division Multiple Access ("TDMA") scheme. Ex. 1006 (Afshary), [0031] ("[T]he client interface logic communicates with the client, communicates

with the modulator, processes the particular data from the client and the modulator, and keeps track of time.”). Data may be transmitted between nodes “continuously, discontinuously, or a combination thereof” while the “modulation is done preferably in a discontinuous, burst fashion to accommodate network type data with minimum receiver setup time.” Ex. 1006 (Afshary), [0037]. With such transmission scheme, data can be transmitted dynamically between nodes without collision due to the TDMA setup. However, this TDMA setup cannot replace the functionality of Mirfakhraei’s handshake protocol (nor does Mr. Bertonis contend it could).

99. Further, to the extent that Mirfakhraei’s handshake protocol could be integrated into Afshary’s ASIC (which I disagree is obvious), the system would require a buffer on all sides of the modulators, additional controls, and an overhaul of the circuit board to handle the increased components to achieve any improvements. A POSITA would need to determine how to handle the broadband to analog conversion within the ASIC when transmitting the data from the MAC layer of the ASIC in Afshary. In view of the increased work to provide any functioning system, a POSITA would not be motivated to insert Mirfakhraei’s complex and costly multi-carrier modulator and multicarrier demodulator into the ASIC of Afshary’s cable LAN adapter, especially when the ASIC of Afshary is complete without the need for improvements.

100. For example, analog components would need to accommodate anywhere from 2 to 4 more bits of information, causing a significant increase in size and power consumption of the devices, leading to additional costs. Further, the ASIC would need new acquisition and tracking hardware that is sufficient for OFDM waveforms with higher SNR requirements. With QPSK, the SNR requirements are on the order of 6dB, whereas the QAM constellations discussed require SNRs of 25 to 30dB. This requires additional logic blocks, larger bit-widths and more gates in ASIC, again, leading to more cost. In another example, the waveform would need to be redesigned to provide an OFDM preamble sufficient for the expected payload sizes. This requires additional design time, experimentation, and innovation, and thus more cost.

***B. Mirfakhraei's point-to-point bit-loading
scheme is incompatible with Afshary's multi-
point communication network***

101. Mirfakhraei's point-to-point bit-loading is incompatible with Afshary because Mirfakhraei's "DMT bit loading scheme" would not characterize the proper bit-loading schemes on Afshary's multi-point network. Mirfakhraei's system is designed to be used on a point-to-point communication network without variance of endpoints. Ex. 1007 (Mirfakhraei), ¶ [0006] ("As part of the DMT initialization, a local modem or transceiver communicates to a remote modem or transceiver bit

loadings determined using processes in accordance the invention.”). In contrast, Afshary’s system is designed to be used on a local area network within an in-home coaxial environment. This environment includes multiple splitters that are connected to multiple endpoints that receive identical data. *See, e.g.*, Ex. 1006, ¶¶ [0007] (“The invention relates to a coaxial cable local area network (LAN) for digitally communicating client generated data between clients of the cable LAN.”), [0018] (“Coaxial cable splitters permit more than one client to receive identical data by dividing the cable into two or more cable wires.”), Figure 1; Ex. 1002, ¶¶ 80–81 (identifying the clients and splitters of Afshary’s environment).

102. Mr. Bertonis does not acknowledge or address the implications of the fundamental differences between Mirfakhraei’s point-to-point environment and Afshary’s in-home coaxial environment. Accordingly, Mr. Bertonis does not address the effects that splitters or multiple clients would have on the data transmissions between the nodes of the proposed combination. A POSITA would have understood that the combined system could not characterize the proper bit loading schemes for bandwidth used on Afshary’s multi-point network.

103. Mirfakhraei’s modem communicates with a remote modem over a point-to-point link via a predetermined connection sequence to establish the bit-loading sequence between the two points. Ex. 1007 (Mirfakhraei), ¶ [0022]–[0023]. Once determined, the sub-channels are *assigned* the bit-loading, which may be

adjusted to achieve the desired data rate. Ex. 1007 (Mirfakhraei), [0031]–[0032] (“After adjusting the loadings to increase total B_{tot} , process 200 moves from step 278 back to step 250 and determines whether the new total loading achieves the desired data rate.”). Then, the process optimizes bit-loading depending on the bandwidth use at the time of the handshake to meet the bitrate requirements of the channel. Ex. 1007 (Mirfakhraei), ¶ [0034] (“To optimize bandwidth utilization, a step 332 selects a sub-channel k to be removed from the set of subchannels carrying received data.”). The process of determining bit-rates on each sub channel between the two points will go through an iterative process to improve the error rate performance of the required bit-loading. Ex. 1007 (Mirfakhraei), [0034] (“After subchannel k has been released, the process 300 returns to step 250 (Fig. 2) to determine whether total loading B_{tot} still provides the desired bit rate. The process continues from step 250 as described above.”).

104. Mirfakhraei’s system of determining, exchanging, and optimizing bit-loading between two points requires a dedicated connection between the two points. Ex. 1007 (Mirfakhraei), ¶¶ [0021], [0023] (“Based on the estimated ratios $SNR(i)$, Rx handshake block 170 determines a bit loading $b(i)$ and a scaling $g(i)$ for each sub-channel i , and control 130 directs transmitter 110 to inform the remote transceiver of the determined loadings $b(i)$ and scaling $g(i)$.”), [0025]. If, instead, Mirfakhraei were to have a connection that had a single point of origin with two potential end-

points while implementing a broadcast signal, it would assign a bit-loading scheme based on the SNR profile to the worst-case end-point, and all communications from that point of origin would have that worst-case bit-loading scheme, including communications from the point of origin to the other endpoint, that has a much lower SNR and could support a greater bit-loading scheme.

105. A POSITA would have understood that Mirfakhraei's system (which operates over a point-to-point connection) could not operate in an environment that connects to multiple endpoints and transmits the same data profile to different endpoints. In other words, a POSITA would have understood that Mirfakhraei's system could not operate in Afshary's in-home environment with multiple clients and splitters.

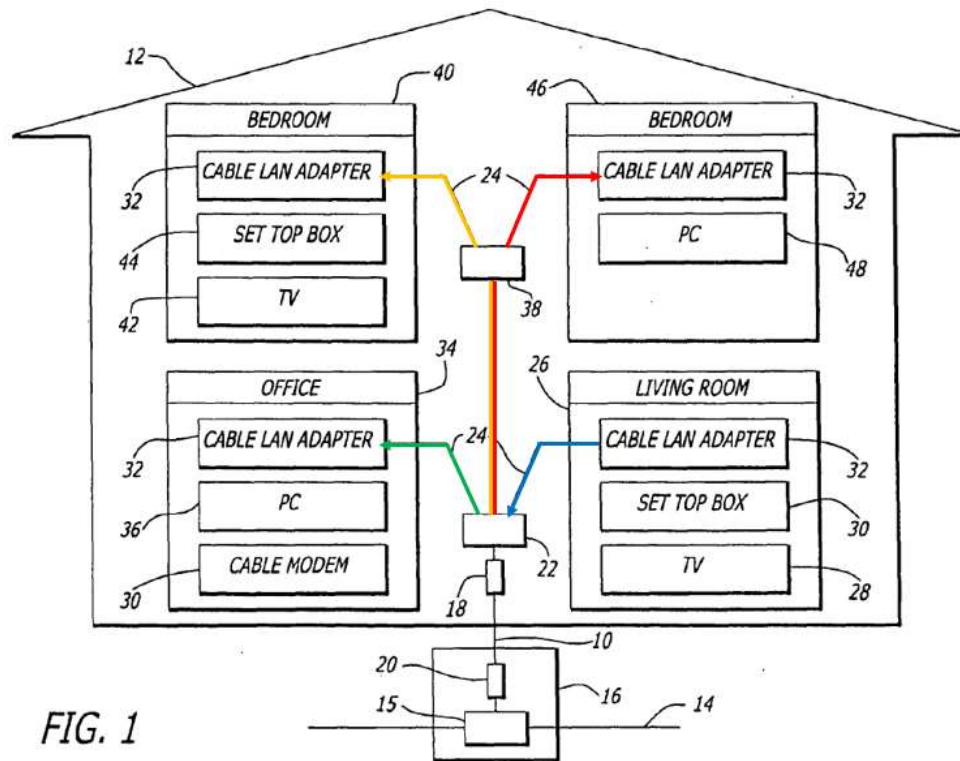
106. As introduced in paragraph 101, Afshary's system uses a home network system with multiple points connected via coaxial cable using splitter junctions. However, Mirfakhraei's bit-loading scheme begins by transmitting a handshake signal to the receiving node. Ex. 1007 (Mirfakhraei), ¶¶ [0020]–[0022] (“Transmitter 110 also includes a TX handshake block 120 which generates time domain samples for a handshake signal sent to a remote transceiver when establishing a connection or during retaining.”). Then, the receiving node transmits a signal back to the transmitting node, which is used to calculate the SNR for the respective sub-channel. Ex. 1007 (Mirfakhraei), ¶¶ [0022]–[0023] (“The estimated

signal to noise ratios $SNR(i)$ can be determined, for example, by directing the remote transceiver to transmit a known pseudo-random signal and then comparing the received signal to the known signal.”).

107. Mr. Bertonis does not explain how Mirfakhraei’s handshake process would work in Afshary’s environment. Rather, Mr. Bertonis stated that the process would be “up to the person implementing the invention how they want to design and build it.” Ex. 2002 (Bertonis Deposition), 58:57:18-60:11. And regarding the calculation of the SNR, Mr. Bertonis stated that one would “look . . . at the signal-to-noise ratio” without explaining how a system with multiple clients and splitters would calculate the SNR. Ex. 2002 (Bertonis Deposition), 61:19-62:2.

108. To the extent that a POSITA tried to use Mirfakhraei’s handshake scheme in Afshary (which there would be no motivation to do), the resulting system would be unusable and inefficient. Specifically, in an example, the transmitting node would have to send a handshake signal to every single client in the system, even when transmitting the same data. Then, each client would transmit a return signal in order to determine the characteristics for that signal path that would be received by the transmitting node. This would create several issues, including that the transmitting node would receive many return signals with no mechanism to determine where the return signals originated. In turn, the transmitting node would

be unable to determine which channel characteristic correspond to what signal path and therefore what client.



Ex. 1006 (Afshary), Figure 1 (annotated).

109. In an example, the cable LAN adapter in the living room generates a probe (blue), which is sent to every other cable LAN adapter in Afshary's network. The probe (green) is received by the cable LAN adapter in the office, which has a signal path that suffers from a low amount of noise. The probe (orange) is received by the cable LAN adapter in the bedroom (40), which has a signal path that suffers from some noise. The probe (red) is received by the cable LAN adapter in the bedroom (46), which has a signal path that suffers from a lot of noise. As a result,

the cable LAN adapter of the living room would use a low bit-loading scheme based on the return information. Then, when the cable LAN adapter in the living room transmits a signal to the office using this low-level bit-loading scheme, the transmission rate is unnecessarily slow. In other words, the path from the living room to the office could handle a much higher bit-loading scheme, but because of the noise of the bedroom, the cable LAN adapter of the living room is limited to the lower level bit-loading scheme.

110. A POSITA would have understood that this would lead to the transmitting node in the combined system calculating the SNR for the entire in-home coaxial environment rather than specific channel characteristics between each endpoint. And without channel characteristics specific to each endpoint, the system could not apply or optimize respective bit loading schemes for each channel between specific nodes. Thus, data would be inefficiently transmitted and potentially less efficient than what Afshary already provides. For these reasons, a POSITA would not be motivated to make the proposed combination.

***C. Afshary and Mirfakhraei operate on
different frequency bands***

111. A POSITA would not be motivated to combine Afshary and Mirfakhraei because Afshary and Mirfakhraei are designed to operate over different frequency bands. Starting with Afshary, its adapters communicate over a frequency

that is “not used by conventional cable services” to avoid interference. Ex. 1006 (Afshary), [0007] (“Connected through coaxial cable, these adapters generate and communicate data transmitting signals that take advantage of the operating frequency spectrum of the coaxial cable so as to not interfere with the operating frequency of the client data within the coaxial cable.”).

112. In an example, conventional cable services may operate over 0 to 950 mHz while Afshary’s adapters operate over 1000 to 2000 mHz. Ex. 1006 (Afshary), [0024], [0025] (“The lower region identified in FIG. 3 as 0-950 MHz is where conventional cable TV, digital cable TV, and cable modem services are offered. Where this is the case, the cable LAN signal operating frequency may be located within the higher region identified as 1000-2000 MHz.”), [0026]–[0028], Figure 3. And while the specific frequency ranges may change, Afshary’s adapters always use a frequency above the frequency bands used by the cable service. *See* Ex. 1006 (Afshary), [0028]. The ability of Afshary’s adapters to use a frequency above the frequency bands used by the cable service is possible because coaxial cables “are a very clear, clean medium capable of handling operating frequencies of up to 2000 MHz.” Ex. 1006 (Afshary), [0024]. This promotes efficiency and an increase in the available bandwidth for transmission characteristics.

113. In contrast, Mirfakhraei provides an ADSL transceiver (i.e., a modem) that communicates over conventional telephone lines. Ex. 1007, (Mirfakhraei)

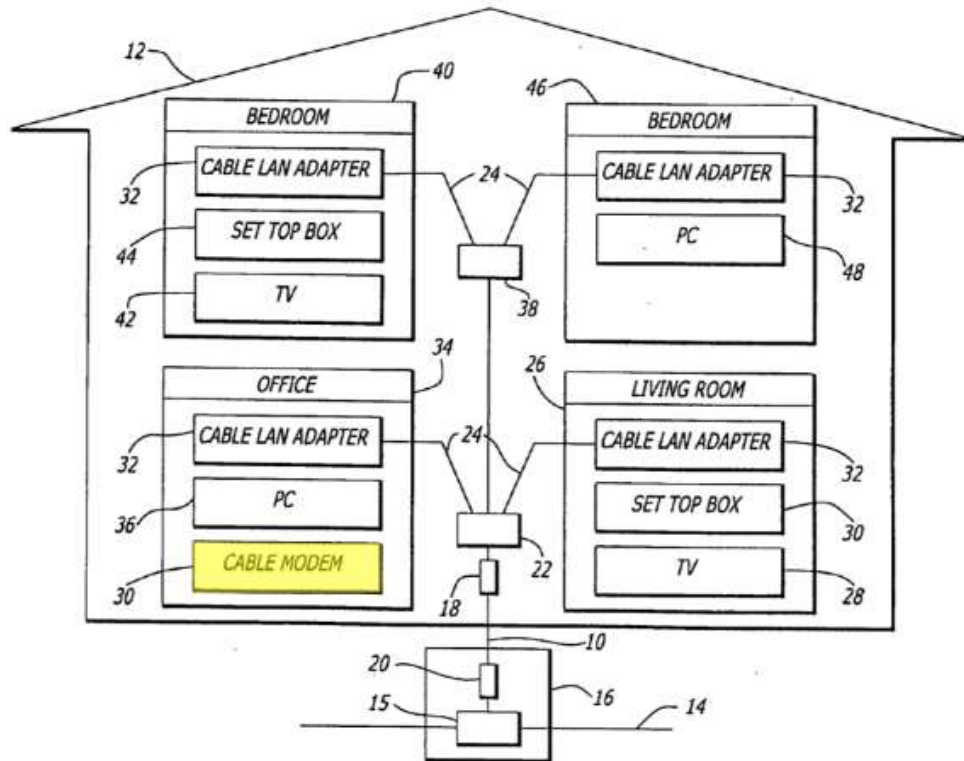
[0015] (“Fig. 1 is the general block diagram of a client side (atu-r) ADSL transceiver 100 including a transmitter 110 and a receiver 190, that connect to a conventional telephone line via a hybrid circuit 150.”). Because Mirfakhraei provides an ADSL transceiver adapted for low range transmissions, its system functions over low frequency bands in order to transmit packets without loss of the signal characteristics over long distances. And this frequency band in which Mirfakhraei’s ADSL transceiver operates is the frequency band that Afshary’s network avoids. Ex. 1006 (Afshary), [0024]-[0025].

114. Mirfakhraei explains that high frequency carriers allow higher rates of data transmission; however, high frequencies are difficult to transmit over conventional lines. Ex. 1007 (Mirfakhraei), [0002] (“Generally, a higher frequency carrier signal permits a higher data transmission rate, but high frequencies are difficult to accurately transmit using systems such as conventional telephone lines. Similarly, conventional phone lines have frequency dependent attenuation, which distorts communication signals having large bandwidths.”). Thus, DMT protocols are used to increase the transmission rate over greater distances. Ex. 1007 (Mirfakhraei), [0003] (“Discrete Multi-Tone (DMT) protocols have been developed to increase the data transmission rate over conventional telephone lines.”).

115. Based on the differing frequency bands, a POSITA would not be motivated to modify Afshary in view of Mirfakhraei. Instead, a POSITA would

have understood that low-frequency approaches like ADSL tend to have better noise performance out of radios (better SNRs) because there is no RF component creating phase noise. Conversely, Afshary's system has an oscillator and a mixer, which impose additional noise on the system and places an upper bound on SNR. Thus, Mirfakhraei's system may have an upper bound on SNR of 35dB to 40 dB, where Afshary's system may have an upper bound of 25dB to 30dB. Based on this difference, a POSITA would not be motivated to implement a higher order QAM on Afshary as opposed to a DSL system like that of Mirfakhraei.

116. Afshary's disclosure further highlights the differences between its system and Mirfakhraei's system. Namely, Figure 1 of Afshary includes adapters that operate at "1000-2000 MHz at the center frequency of 1300 MHz with a bandwidth of 5 MHz." Ex. 1006 (Afshary), [0025], Figure 1 (reproduced below). Figure 1 also includes a cable modem 30 that operates from zero to 950 MHz. Ex. 1006 (Afshary), [0025] ("The lower region identified in FIG. 3 as 0-950 MHz is where conventional cable TV, digital cable TV, and cable modem services are offered."). In an example, Afshary states that the cable modem 30 may be an "asymmetric digital subscriber loop (ADSL) modem," which provides internet access to the personal computer 36. Ex. 1006 (Afshary), [0018] ("[H]igh speed access may be achieved through the shown a cable modem 30, as well as other connection such as asymmetric digital subscriber loop (ADSL) modem.").



Ex. 1006 (Afshary), Figure 1 (annotated).

117. This disclosure demonstrates that Afshary's network may include an ADSL modem, but Afshary's network does not use the ADSL modem to achieve its client communications. Instead, Afshary's in-home communications specifically avoid the frequency band at which the ADSL modem operates. This also confirms (as Afshary describes in its disclosure) that Afshary uses higher frequency bands to achieve effective transmission and avoid interference between the RF signals. Mirfakhraei's system provides the data the Afshary's system will transmit with the in-home network.

B. Ground A relies on hindsight to combine Afshary and Mirfakhraei

118. As introduced in paragraph 80, Mr. Bertonis contends that a POSITA would have been motivated to combine Afshary and Mirfakhraei. *See, e.g.*, Ex. 1002 (Bertonis Declaration), ¶ 139 (“It is my opinion that a POSITA would have been motivated to modify Afshary’s cable LAN adapter to implement the DMT bit-loading protocol of Mirfakhraei because doing so would increase the data transmission rate of Afshary’s coaxial cable network, as taught by Mirfakhraei.”). I disagree with Mr. Bertonis, and it is my opinion that this proposed combination relies on hindsight, rather than the references themselves.

119. Initially, Mr. Bertonis fails to identify a single instance of bit-loading on a coaxial network in any reference in this proceeding. Further, none of the disclosure demonstrates that the concepts of the ’518 Patent were known or present in a POSITA’s mind. A POSITA would have understood that Afshary already solves the impairments that Mr. Bertonis relies on as support for his motivation to combine. *See* ¶¶ 120–124. Finally, a POSITA (who would not be motivated to combine Afshary and Mirfakhraei) would not have looked to the fundamentally different system of Mirfakhraei. *See* Section ¶¶ 125–133.

i. Afshary already addresses the alleged impairments

120. Mr. Bertonis opines that a POSTIA would have been motivated to modify Afshary with Mirfakhraei because “data transmissions between the cable

LAN adapters would be more robust and reliable because they would be less affected by the harsh environment of a coaxial cable infrastructure, including outside interference and signal reflections.” Ex. 1002 (Bertonis Declaration), ¶ 141. A POSITA would have recognized that Afshary already solves these alleged “shortcomings.” As expressly recognized by Afshary, coaxial cables are a “clean” medium for data communications. See ¶ 122.

A. Afshary already addresses the “variable frequency response”

121. A POSITA would not be motivated to combine Afshary and Mirfakhraei based on Mirfakhraei’s “increased data transmission rate” or “interference and signal reflections.” Institution Decision, 17 (“According to Petitioner, implementing Mirfakhraei’s DMT bit-loading protocol would increase the data transmission rate in [Afshary’s] coaxial cable network, and would also improve reliability and robustness of communications therein.”).

122. As an initial matter, Afshary’s system does not include any variable frequency responses caused by interference and signal reflections. Mr. Bertonis does not allege that Afshary does, so we appear to agree on that point. He does however rely on Mirfakhraei to show a deficiency in Afshary’s communication medium. Ex. 1002 (Bertonis Declaration), ¶ 139 (“[A] POSITA would have been motivated to modify Afshary’s cable LAN adapter to implement the DMT bit-

loading protocol of Mirfakhraei because doing so would increase the data transmission rate of Afshary's coaxial cable network, as taught by Mirfakhraei.”). But even assuming that Mirfakhraei could establish a deficiency in Afshary's fundamentally different system, a POSITA would have understood that Afshary addresses reflections by using its “[f]ilters within the Baseband section 90 [to] filter out such reflected signals.” Ex. 1006 (Afshary), [0042]. Because Afshary provides a mechanism to address reflections, a POSITA would not have viewed reflections as a problem needing a solution. Moreover, Afshary's use of a filter, which is a simple hardware component, reflects Afshary's goal of cost reduction and simplicity. *See* ¶¶ 84–87. Introducing multi-carrier modulation in every device on the network, would be a far more expensive and complicated solution that contradicts Afshary's stated goals.

B. Afshary already provides a robust and reliable communication system

123. A POSITA would not have been motivated to modify Afshary with Mirfakhraei based on “the reliability and robustness of the communications within Afshary's coaxial cable network” because Afshary already provides robust and reliable data transmissions for in-home networks. Ex. 1006 (Afshary), [0024]–[0025], [0027]. Afshary transmits packets with defined headers and preambles to ensure signal transmissions can be reliably received and decoded. Ex. 1006

(Afshary), [0036]–[0037]. When transmitting data, Afshary also adds bytes to detect corrupted transmissions and a means to correct such errors. Ex. 1006 (Afshary), [0037] (“On interacting with FEC encoder 92, parity bits (or bytes) are added to the data to permit detection of data that becomes corrupted in transit as well as permit correction of the same.”). These features allow Afshary to achieve reliable and efficient “data transmission” without the need for further modulation.

124. Additionally, Mirfakhraei’s optimized bit-loading would not improve Afshary’s network because Afshary already includes bit-loading schemes that transmit in an efficient and optimal manner for its network. And Afshary’s bit-loading schemes efficiently transmit signals at an optimal power. Specifically, Afshary uses single carrier signaling as a robust, cost-effective method to provide high bandwidth in a “clean” medium, like coaxial cables. Ex. 1006 (Afshary), [0037] (“Thus, in order to keep costs low and the system robust, the architecture design of adapter 32 uses a digital modulation scheme such as Frequency Shift Keying (FSK) modulation or Binary Phase Shift Keying (BPSK) modulation.”). With single carrier modulation, each piece of data is encoded, which reduces complexity and the speed burden on the syndrome block with other bits added to specify routing, content data, and other known bits. Ex. 1006 (Afshary), [0036] (“The advantage of using a RS ECC encoder is that the RS ECC encoder may be reused in the FEC decoder 94, thereby dramatically reducing the complexity of

syndrome calculation and thus reducing processing speed burden on the syndrome block.”). In view of these features, a POSITA would have understood that Afshary’s system includes dedicated preambles and other packets that provides efficient transmission and thus would not be motivated to look to Mirfakhraei.

**ii. A POSITA would not have looked to Mirfakhraei’s
multi-carrier modulation scheme to improve
Afshary**

125. A POSITA would not have looked to Mirfakhraei to improve the “harsh” environment of Afshary’s system. First, Afshary’s system operates over coaxial cables, which are clean medium, not a harsh environment as Mr. Bertonis alleges. *See* ¶¶ 126–129. Furthermore, Afshary’s modulation scheme already transmits data on channels with less noise and interference, and does so using optimal power for its architecture. *See* ¶¶ 130–133.

A. Afshary operates over a clean medium

126. Mr. Bertonis opines that “[a] coaxial cable communication medium **can** be a harsh environment for communication as the frequency response of a coaxial cable can vary significantly.” Ex. 1002 (Bertonis Declaration), ¶ 54. I disagree with Mr. Bertonis that coaxial cables are a harsh environment.

127. In its “Background Information,” Afshary differentiates between coaxial cabling and telephone lines. Specifically, Afshary explains that telephone

lines suffer from “RF interference” and “RF emission regulations.” Ex. 1006 (Afshary), [0005], Table 1 (reproduced below). In contrast, coaxial cables “are a very clear, clean medium capable of handling operating frequencies of up to 2000 MHz.” Ex. 1006 (Afshary), [0024] (“These cables themselves are *a very clear, clean medium* capable of handling operating frequencies of up to 2000 MHz.”), [0027] (“With coaxial cabling, speeds greater than 100 Mbps can be achieved.”). In view of this clear disclosure, coaxial cables are a clean medium in Afshary’s system and not a “harsh” environment as Mr. Bertonis contends.

<u>Alternative Mediums</u>	
MEDIUM	LIMITATIONS
AC power-lines	Unregulated Low bit-rate (Harsh environment) Data security issues
Telephone lines	Perceived usage hazards RF interference RF emissions regulations
Wireless	Limited bandwidth Expensive Data security issues Transmission disruption due to movement
New wires	Installation costs Maintenance costs

Ex. 1006 (Afshary), Table 1.

128. Moreover, to the extent that a POSITA would have been motivated to “improve” Afshary’s transmission quality (which that would not), a POSITA would not have looked to Mirfakhraei. Mirfakhraei provides an ADSL transceiver that operates over telephone lines. Telephone lines are an inferior medium for

transmitting Afshary's high-frequency in-home network. Also, telephone lines are a fundamentally different medium than coaxial and a POSITA would have understood that a system that functions over telephone lines would not necessarily apply to an in-home coaxial environment. For at least these reasons, a POSITA would not be motivated to look to Mirfakhraei to "improve" Afshary's in-home network even if Mr. Bertonis was correct (which he is not) about coaxial cables as a "harsh" medium.

129. Mr. Bertonis also relies on "signal interference" as a reason to use multi-carrier modulation techniques. But, again, Afshary's clear disclosure lists interference as a limitation with telephone lines, not coaxial cables. Ex. 1006 (Afshary), [0005], Table 1. Interference from other signals is not an issue in Afshary because Afshary communicates over high frequencies and over shielded cables to prevent interference from other sources. See ¶ 123 (describing features in Afshary that ensure effective data transmission).

B. Afshary includes a power-efficient modulation scheme

130. Mr. Bertonis opines that the "Afshary-Mirfakhraei system would also be improved by using more available bandwidth for communicating, and using higher order modulation schemes to transmit more bits onto frequency channels that experience less noise and/or interference." Ex. 1002 (Bertonis Declaration), ¶ 141.

I disagree. Mr. Bertonis' argument fails because a POSITA would have understood that Afshary's modulation scheme already transmits data on channels with less noise and interference, and does so using optimal power for its architecture.

131. As introduced in paragraph 84 to 87, Afshary uses single carrier signaling as a robust, cost-effective method to provide high bandwidth in a "clean" medium, like coaxial cables. Ex. 1006 (Afshary), [0037] ("Thus, in order to keep costs low and the system robust, the architecture design of adapter 32 uses a digital modulation scheme such as Frequency Shift Keying (FSK) modulation or Binary Phase Shift Keying (BPSK) modulation."). With single carrier modulation, each signal uses a modulation scheme like "Frequency Shift Keying (FSK) modulation or Binary Phase Shift Keying (BPSK) modulation" and other forms of modulation will include "Quadrature Phase Shift Keying (QPSK)." Ex. 1006 (Afshary), [0037]. And with single carrier modulation, each piece of data is encoded, which reduces complexity and the speed burden on the syndrome block. Ex. 1006 (Afshary), [0036] ("The advantage of using a RS ECC encoder is that the RS ECC encoder may be reused in the FEC decoder 94, thereby dramatically reducing the complexity of syndrome calculation and thus reducing processing speed burden on the syndrome block."). Based on this disclosure, a POSITA would have understood that the Afshary's modulation already ensures efficient communication through its system.

132. Mr. Bertonis does not address these features in Afshary. Moreover, Mr. Bertonis' combination would cause the bit-loading to correspond to the overall system rather than the specific SNRs of each channel for each endpoint. *See* ¶¶ 104–110. This would lead to communications that use too much bit-loading for a given SNR value (leading to an inefficient use of too much power) or communications that use too little bit-loading on a channel (leading to an inefficient use of the channel). *See* ¶¶ 104–110. Again, without assigning bit-loading that corresponds to the SNR of the channel for each specific endpoint, the combination would result in inefficient use of power and data transmission. *See* ¶¶ 104–110.

133. In contrast to the inefficient combined system of Afshary and Mirfakhraei, Afshary's system provides modulation schemes that allow for the efficient transmission of high-resolution data that requires increased power to achieve the results. Ex. 1006 (Afshary), [0025]–[0026]. Thus, Mr. Bertonis' reliance on improving power and efficiency would not motivate a POSITA to combine Afshary and Mirfakhraei.

C. Ground 3 does not render claim 3 obvious

134. Similar to my analysis in paragraphs 111 to 117, a POSITA would have understood that Afshary and Mirfakhraei are designed to operate over different frequency bands. Mirfakhraei provides an ADSL transceiver (i.e., a modem) that communicates over conventional telephone lines. Ex. 1007, (Mirfakhraei) [0015]

(“Fig. 1 is the general block diagram of a client side (atu-r) ADSL transceiver 100 including a transmitter 110 and a receiver 190, that connect to a conventional telephone line via a hybrid circuit 150.”). Because Mirfakhraei provides an ADSL transceiver adapted for low range transmissions, its system functions over low frequency bands and small signal bandwidths in order to transmit packets without loss of the signal characteristics over long distances. And this frequency band in which Mirfakhraei’s ADSL transceiver operates is the frequency band that Afshary’s network avoids. Ex. 1006 (Afshary), [0024]-[0025].

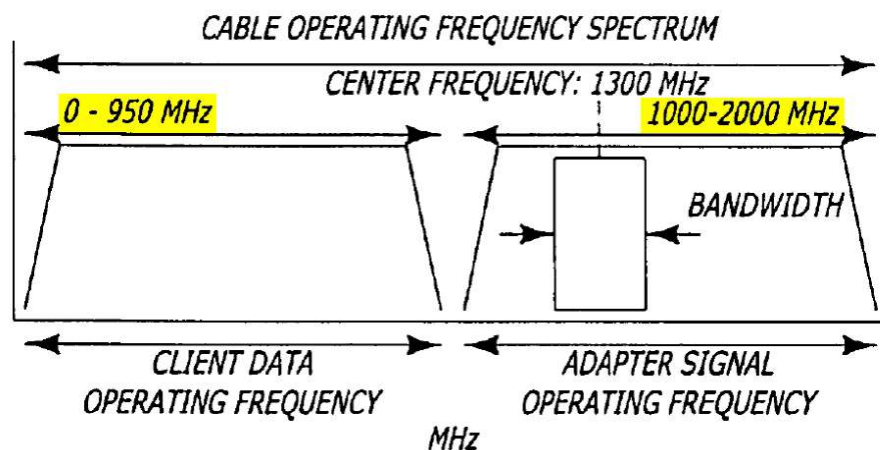
135. Mirfakhraei explains that high frequency carriers allow higher rates of data transmission; however, high frequencies are difficult to transmit over conventional telephone lines. Ex. 1007 (Mirfakhraei), [0002] (“Generally, a higher frequency carrier signal permits a higher data transmission rate, but high frequencies are **difficult to accurately transmit** using systems such as conventional telephone lines. Similarly, conventional phone lines have frequency dependent attenuation, which distorts communication signals having large bandwidths.”). Thus, DMT protocols are used to increase the transmission rate over greater distances. Ex. 1007 (Mirfakhraei), [0003] (“Discrete Multi-Tone (DMT) protocols have been developed to increase the data transmission rate over conventional telephone lines.”). Mirfakhraei’s disclosure compares its DMT protocol to that of ADSL, HDSL, VDSL, and light rate ADSL. Ex. 1007 (Mirfakhraei), [0003] (“Examples of DMT

protocols include the Asymmetric Subscriber Loop (ADSL or G.992.1), the High bit rate Digital Subscriber Loop (HDSL), the Very fast asymmetric Digital Subscriber Loop (VDSL), and light rate ADSL (G.992.2), which have been proposed by or are standards of groups including the ITU, ANSI, and ETSI.”).

136. In contrast to Mirfakhraei, Afshary’s adapters communicate over frequencies that are “not used by conventional cable services” to avoid interference. Ex. 1006 (Afshary), [0007] (“Connected through coaxial cable, these adapters generate and communicate data transmitting signals that take advantage of the operating frequency spectrum of the coaxial cable so as to not interfere with the operating frequency of the client data within the coaxial cable.”). In an example, conventional cable services may operate over 0 to 950 mHz while Afshary’s adapters operate over 1000 to 2000 mHz. Ex. 1006 (Afshary), [0024], [0025] (“The lower region identified in FIG. 3 as 0-950 MHz is where conventional cable TV, digital cable TV, and cable modem services are offered. Where this is the case, the cable LAN signal operating frequency may be located within the higher region identified as 1000-2000 MHz.”), [0026]–[0028], Figure 3. And while the specific frequency ranges may change, Afshary’s adapters always use a frequency above the frequency bands used by the cable service. *See* Ex. 1006 (Afshary), [0028].

137. The ability for Afshary’s adapters to use frequencies above the frequency bands used by the cable service is possible because coaxial cables “are a

very clear, clean medium capable of handling operating frequencies of up to 2000 MHz.” Ex. 1006 (Afshary), [0024]. Figure 3 of Afshary also shows the data range that the client data typically uses for its operating frequencies as anything below 950 mHz. Ex. 1006 (Afshary), Figure 3 (reproduced below). This range is used by “cable TV, digital cable TV, and cable modem services.” Ex. 1006 (Afshary), [0025] (“The lower region identified in FIG. 3 as 0-950 MHz is where conventional cable TV, digital cable TV, and cable modem services are offered.”). And Afshary’s adapters operate over 1000 to 2000 mHz. Ex. 1006 (Afshary), [0025].



Ex. 1006 (Afshary), Figure 3 (annotated).

138. Turning to claim 3, Mr. Bertonis’ concludes that “Afshary teaches that the RF & Mixed Signal section 100 translates modulated data to a 1300 MHz center frequency (red) and that the modulated data occupies a bandwidth of 5 MHz (dark blue), which does not overlap the operating frequency of the conventional cable services.” Ex. 1002 (Bertonis Declaration), ¶ 163. I disagree with Mr. Bertonis.

139. There is no basis to assume that Mirfakhraei's modulation scheme would work at higher frequencies. Mirfakhraei's only relevant disclosure states that modulation schemes over "high[er] frequencies are difficult to accurately transmit" data. Ex. 1007 (Mirfakhraei), [0002] ("Generally, a higher frequency carrier signal permits a higher data transmission rate, but high frequencies are difficult to accurately transmit using systems such as conventional telephone lines.").

140. Moreover, Mr. Bertonis does not provide any discussion on how Mirfakhraei will transmit data accurately over the higher frequencies or larger bandwidths in Afshary. Ex. 1006 (Afshary), [0027] ("A significant advantage of this invention is the large bandwidths that may be applied in transmitting data. For example, within the 1000-2000 MHz region shown in FIG. 3, bandwidths of 5 MHz, 10 MHz, 20 MHz, 50 MHz, or higher are possible."). Mr. Bertonis appears to only rely on his own assumption without addressing disclosure of Afshary or Mirfakhraei. Mirfakhraei discusses the difficulty of transmitting at higher frequencies, which is why it was designed to work at lower frequencies. Ex. 1007 (Mirfakhraei), [0002]-[0003]; *see* ¶¶ 113–115. Conversely, Afshary discusses the use of single-carrier modulation schemes to transmit data at these higher frequencies. Ex. 1006 (Afshary), [0026]; *see* ¶¶ 113–115. Afshary does not discuss the use of multi-carrier modulation schemes at the higher frequency bands above those used by the cable networks. Thus, it is my opinion that Ground A fails to render obvious claim 3.

VIII. Reservation of Rights

141. I reserve the right to amend or supplement this declaration as this case proceeds and any additional information comes to light.

142. I understand that traditionally no live expert testimony is used at the PTAB, and I presently have no plans to testify, however should I be asked, I reserve my right to use exhibits to summarize or exemplify my opinions (including exhibits I have not yet created) if called to testify.

143. If it would be helpful to the Tribunal, I am willing and able to provide additional background.

144. I further reserve the right to respond to any opinions presented by any of Respondents' experts regarding the meaning of any claim term or limitation within the Asserted Claims. I also reserve the right to provide further opinions in this case, such as opinions regarding non-infringement and/or invalidity of the Asserted Patents, if requested to do so.

145. I declare under penalty of perjury that this declaration contains a true and correct statement of my opinions, based on the information available to me.

Dated: December 18, 2024

Signed by:

D269017F295E408...

Mr. Albert Garrett

Appendix A

Curriculum Vitae

Albert L Garrett

Systems Engineer * Principal Engineer * Director of Engineering

An expert in the development, optimization, productization, and standardization of signal processing for communications.

A collaborative leader in next-generation networking standards committees, working closely with industry leaders such as Cisco, Comcast, Verizon, Intel, and Broadcom.

An engineer with recognizable soft-skills as evidenced by advisor roles and board seat on non-profit organization.

SIGNAL PROCESSING COMPETENCIES

- System modelling/simulation
- Bit-true models
- C/C++/Python
- CDMA/OFDM/OFDMA
- FEC/RS/LDPC
- Impairment comp.
- Acquisition algos
- Analog/RF Specs
- AGC
- Algorithm design/optimization

AI COMPETENCIES

- Neural Networks
- Belief-propagation
- Probability Theory
- DNN, CNN, RNN,
- Bayes Networks
- Genetic Algorithm
- Deep Reinforcement Learning
- NLP
- Tensorflow
- Technical paper review and implementation

Experience

ComplexIQ Inc.

2011 – present

Principal Engineer / Co-founder / Manager

Supporting four major IC customers and deploying 10+ million devices in the field

Advised executive management in corporate strategy, new product R&D, technical marketing, customer interaction and engineering management. Trusted and influential resource among Fortune 100 companies such as Verizon, Comcast, Cox, Intel, and Cisco by:

- + contributing to Board of MoCA
- + chairing MoCA Certification Working Group
- + contributing to MoCA Specification Working Group for 10Gbps standard.

Researched and developed Convolutional/Deep Neural Network to allow remote diagnosis of problems parts with no prior knowledge of the home coax network configuration; from zero knowledge to fully implemented python/tensorflow CNN, allowing business discussion.

Researched and developed on-site diagnostics ios/android app to determine network problems with no prior knowledge of the home coax network configuration; from concept

to successful proof-of-concept, from zero knowledge to fully implemented Android/iOS app with Bayes algorithms for conversion of RF and MoCA measurements to UI/UX presentation.

Defined, implemented, specified fixed-point transmitter, receiver and algorithms for MoCA 2.0/2.5/3.0 system including LDPC belief-propagation / message passing, IQ on-line calibration, AGC convergence, time/freq acquisition and tracking. Bit-true models with system-level impairments.

Specified RF / analog requirements for transceiver front end (DAC/ADC), and baseband. Advised Analog Devices, Maxlinear, ST Micro, and MStar on development of compatible, proprietary MoCA radio designs.

Cisco Systems, Inc.	2008 – 2011
Staff Engineer	
<i>Member of small R&D team focused on IP development and supporting two major customers</i>	

Provided strategic leadership on behalf of Cisco in MoCA standard organization. Led direction for next generation MoCA solutions and MoCA 2.0 standards effort within the company. Chair of MoCA 2 Specification Working Group.

Coordinated and specified RF, AFE, and baseband for internal and external teams. Defined and modeled baseband algorithms to compensate for radio impairments.

Conexant Systems, Inc.	2007 – 2008
Multiple Roles	
<i>Member of small R&D team focused on MoCA development</i>	

Director of Engineering (Dec 2007 – Feb 2008)

Promoted to co-lead for international team located in LA and Bangalore to develop MoCA MAC/PHY/RF IC.

Served as representative member of entire team during M&A discussions between NXP and Conexant.

Staff Engineer (Oct 2006 – Dec 2007)

Led team of PHY designers in Bangalore India to implement MoCA specification in system model and RTL.

Defined analog specification with analog/mixed-signal team for MoCA transceiver for MoCA signaling and calibration support.

Older experiences available on request.

US Patents

	Conexant
6724834	Threshold detector for detecting synchronization signals at correlator output during packet acquisition

6748200	Automatic gain control system and method for a ZIF architecture
6973296	Soft decision gain compensation for receive filter attenuation
7174138	Power-based hardware diversity
7272109	Modified OFDM subcarrier profile (Definition of a half rate mode of operation for 802.11 OFDM)
Cisco	
8468223	Cooperation for consumer and Service Provider MoCA Networks
8804516B2	Opportunistic Transmissions within MoCA
9042823	Method, system, and apparatus for Extended Rate/Range communication over a communication network
9106435B2	Efficient Data Transmissions within MoCA
9998402	MoCA Packet Aggregation
ComplexIQ	
20170142030A1	Digital Coax Network Splitter (pending)

Education

Udacity AI Nanodegree, 2018	Artificial Intelligence, Machine Learning and Deep Neural Networks using Python and Tensorflow
Clemson University, 1998	Masters of Science Electrical Engineering - 4.0/4.0 GPA Digital Communications Theory Thesis on signal acquisition in DSSS technologies
Auburn University 1996	Bachelor of Science Electrical Engineering - 3.8/4.0 GPA Statistical/Mathematical Analysis Digital Communication/Information/Coding Theory Image processing; Comm Theory